

HUKILL CHEMICAL CORPORATION  
BEDFORD, OHIO

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SITE INVESTIGATION REPORT  
APPENDIX C  
VOLUME II

4-87

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PROJECT #495-1  
APRIL 1987

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EDER ASSOCIATES  
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eder associates  
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April 10, 1987  
File #495-1

Mr. Craig Liska  
Waste Enforcement Branch  
RCRA Enforcement Section  
Region V - 5HE-2 JCK  
United States Environmental  
Protection Agency  
230 South Dearborn Street  
Chicago, Illinois 60604

Re: Hukill Chemical Corporation  
Bedford, Ohio  
EPA I.D. No. 001926740

Dear Mr. Liska:

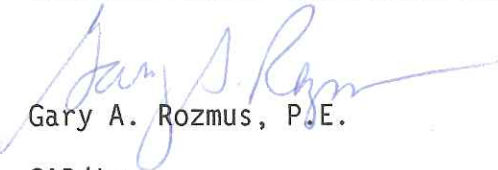
We are pleased to submit our draft engineering report, "Site Investigation Report" for your review.

This report presents the results of site work conducted to: 1) determine the nature and extent of contamination from the solid waste management units; 2) determine the need for corrective actions; and 3) select and implement the Environmental Protection Agency approved corrective action.

We are available to discuss the report with you. Please contact our office if you have any questions.

Very truly yours,

EDER ASSOCIATES CONSULTING ENGINEERS, P.C.

  
Gary A. Rozmus, P.E.

GAR/tg  
Enc.

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## 1.0 INTRODUCTION

Hukill Chemical Corporation (HCC) owns and operates a chemical distribution center and solvent recovery facility located in an industrial park at 7013 Krick Road, City of Bedford, Cuyahoga County, Ohio. HCC recycles spent industrial solvents using two thin film evaporators and a fractionating distillation tower. HCC has RCRA Interim Status as a generator and storage facility and has applied for a RCRA Part B Permit. A site plan is included in Appendix A (Drawing No. 1). A detailed description of the facility's operations is provided in the Part B Permit application. Site and regional topographic maps are also provided in the Part B application.

HCC entered into a Consent Agreement and Final Order (CAFO) with the United States Environmental Protection Agency (USEPA) to conduct an investigation: to determine the nature and extent of potential contamination due to storage operations at the facility solvent tank farm; to determine the need for corrective action to eliminate potential threats to the environment; and to select and implement the EPA approved cost effective corrective action. Pursuant to the terms of the CAFO, Eder Associates (EA) submitted an engineering report, "Plan for Determining the Extent of Potential Contamination", November 1985 to the USEPA and Ohio Environmental Protection Agency (OEPA). This report was modified by a letter to the USEPA dated January 16, 1986 and was approved by the USEPA and the OEPA in February 1986. The engineering report described a six part site investigation to be conducted at HCC:

- Task 1: Background Information
- Task 2: Site Investigation
- Task 3: Report of Site Investigation
- Task 4: Review of Alternative Corrective Actions
- Task 5: Conceptual Design of Selected Alternative
- Task 6: Corrective Action Study Report

The field work described in Task 2 of the November 1985 engineering report was conducted in April and May 1986. At that time, USEPA requested that HCC submit a formal plan to address the corrective action requirements of the 1984 Hazardous and Solid Waste Amendments (HSWA) that apply to facilities seeking RCRA permits.

EA submitted a draft engineering report, "Proposed Investigation for the Certification Regarding Potential Releases from Solid Waste Management Units" in July 1986. The final report was submitted in August 1986 and was modified by EA's September 1986 letter to the USEPA. The modified report was verbally approved by USEPA. The report describes the investigation to be conducted for each of the solid waste management units (SWMU) at the HCC facility to determine whether releases of hazardous waste constituents have occurred, the extent and concentrations of releases and appropriate corrective action.

The SWMU investigation was divided into the work tasks described in the November 1985 engineering report. Because the work described in the November 1985 and the August 1986 engineering reports overlapped, USEPA agreed to allow the work to be performed concurrently. The site work related to the SWMUS was conducted in September and October 1986.

The CAFO required that HCC close an underground cistern located at the facility. EA submitted to USEPA and OEPA an engineering report, "Closure Plan for Underground Cistern" which was approved by OEPA in October 1985. OEPA permitted HCC to conduct the work associated with closing the cistern concurrently with the work outlined in the November 1985 and August 1986 engineering reports. The closure work was conducted in April/May 1986 and September/October 1986.

In November 1985, HCC entered into a Findings and Orders (F&O) with the OEPA to determine the cause of exceedances of the facility



NPDES discharge permit and to develop and implement appropriate corrective measures.

Preliminary sampling and analysis of a set of indicator parameters indicated that the exceedances were caused by infiltration of the storm water piping at the site. The terms of the F&O permitted HCC to conduct site work associated with the investigation of storm water discharge problems and to identify and implement corrective measures to resolve discharge problems concurrently with the work related to the SWMUs, the solvent tank farm, and the underground cistern.

This submission summarizes and analyzes all work conducted pursuant to the following EA reports and the NPDES Findings and Orders:

1. "Plan for Determining the Extent of Potential Contamination";
2. "Closure Plan for Underground Cistern"; and
3. "Proposed Investigation for the Certification Regarding Potential Releases from Solid Waste Management Units".

## 2.0 DESCRIPTION OF SOLID WASTE MANAGEMENT UNITS

The following subsections describe the SWMUs and associated areas investigated at the HCC facility. The approximate locations of the units are shown in Drawing Nos. 1, 2 and 3 in Appendix A.

### 2.1 Solvent Tank Farm

Reclaimed and waste solvents are stored in aboveground, steel tanks in a bermed tank farm. The southern berm is masonry with earthen materials forming the remainder of the berm to a height of approximately four feet. The base of the tank farm is gravel.

There are two pipe galleys to the tank farm installed in the north-south directions. One pipe galley is installed at approximately grade elevation and penetrates the masonry berm in the southwest corner of the tank farm. The second pipe galley is routed over the four foot high masonry berm in the southeast corner of the tank farm.

The tank farm area is dewatered using a collection sump located in the northeast corner and a second sump located in the southwest corner of the tank farm. *to where?*

### 2.2 "Chem-Pack" Fill Area

With OEPA consent, a material known as "Chem-Pack" was used during the period 1970-1971 to grade areas north of the solvent tank farm. The "Chem-Pack" material was considered non-hazardous solid waste formed by the solidification of pickle liquor.

### 2.3 Northwest Fill Area

Construction debris and fill material were used to grade the northwest area of the HCC facility.

## 2.4 Underground Cistern

An underground, precast, concrete cistern was installed around 1975 east of the HCC facility buildings. Floor drains and collection trenches, located in the HCC processing building were interconnected to the cistern which served as a gravity fed secondary spill containment storage tank. Floor drains and trenches connected to the cistern were sealed in 1982. Drawing No. 2 shows the cistern piping in the process building.

## 2.5 Neutralization Pits

HCC used two limestone filled pits to neutralize spent acid waste. The pits were located below grade in an area north of the HCC buildings. The pits were used between approximately 1974 and 1976 at which time they were filled to grade and abandoned.

## 2.6 No Free Liquid Container Storage Area

This area is located to the east of the HCC facility building. It is used to store 55 gallon drums which do not contain free liquids. The storage area consists of a concrete pad surrounded on the south and eastern boundaries by a six inch high concrete curb.

## 2.7 API Tank Basin

An underground, 10,000 gallon API separator tank is located to the east of the solvent tank farm. A containment basin for storm water runoff is located above the API tank. The depth at the center of the basin is approximately 4 ft. The API tank presently serves two purposes. It is the collector for a french drain system, located to the east of the solvent tank farm (Drawing No. 3) installed to collect subsurface seepage that could migrate in an easterly direction from the tank farm. The API tank is also used to store storm water collected in a 1,500 gallon tank (Drawing No. 3) connected to the storm water collection system. The transfer of storm water to the API tank is performed during dry weather periods.

## 2.8 Storm Water Collection System

The HCC facility has a storm water sewer collection system which diverts storm water to Outfall No. 001 located east of the Hukill facility buildings at the tributary to Tinkers Creek. The discharge to the tributary is regulated by a State NPDES permit which limits have been exceeded from time to time. Drawing No. 3 shows the approximate layout of the storm water collection system.

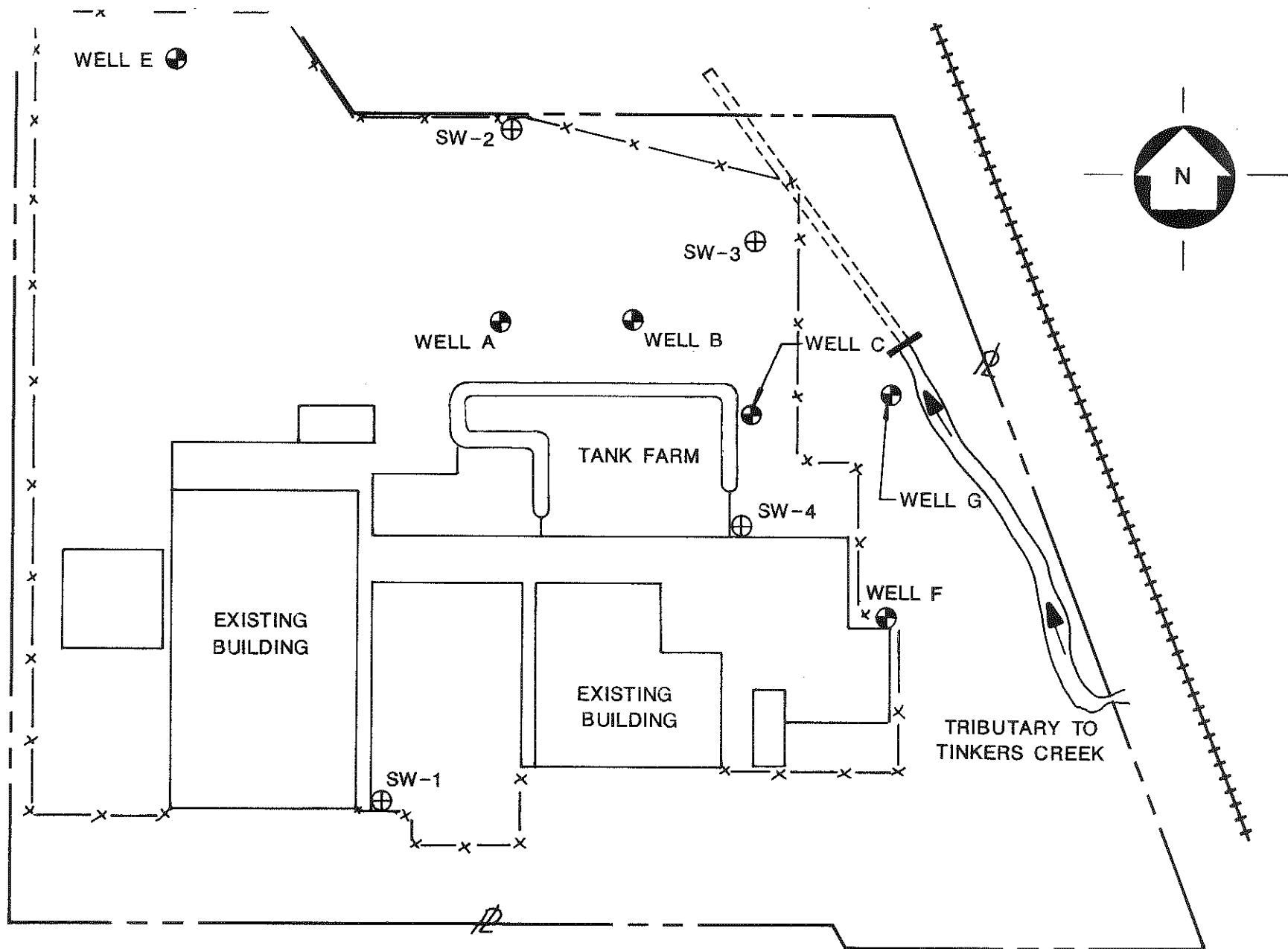
### 3.0 HYDROGEOLOGICAL CONDITIONS

Investigations conducted during April/May and September/October 1986 included test borings and monitor well installations to define soil, subsoil, shallow geologic and groundwater conditions at the HCC site. A total of 63 soil borings plus six monitor wells were installed during this period. Currently, there are a total of 10 monitor wells on site as shown on Figure 1. All monitor well and soil boring logs are presented in Appendix B. Four hydrogeological cross sections, designated as sections A-A', B-B', C-C' and D-D', are presented at the end of this section (Figures 4 through 8).

Most of the site is underlain by fill material ranging in thickness from one ft. to over 25 ft., and consisting of silty-sandy clay loam except in the "Chem-Pack" and Northwest fill areas where other types of fill are present as described in preceeding sections of this report. Underlying fill material is glacial till deposited during the Illinoian stage of glacial advancement. It is a silty clay till which varies in thickness at the site. In some areas, the fill material overlies the shale bedrock (Meadville Shale). Grain size analysis tests performed on samples of the fill, till, and shale by Triggs and Associates, Inc. are presented in Appendix A. <sup>B</sup>

A fractured and weathered zone characterizes the upper 25 ft. of shale. Numerous fractures are present which allow the circulation of shallow groundwater. Beneath this zone, the shale is more consolidated, less permeable, and is an aquiclude (not a water bearing unit).

A small gulley borders the northern and eastern edges of the site where the surface topography drops sharply into a small intermittent tributary of Deerlick Run, Tinkers Creek, the Cuyahoga River and, ultimately, Lake Erie. Unconsolidated glacial deposits pinch out in this gulley, which contains alluvial deposits consisting of



- ⊕ MONITORING WELL (INSTALLED IN 1986).  
 ⊕ MONITORING WELL (INSTALLED IN 1982).

## WELL LOCATIONS

SCALE 1" = 100'

interbedded silty clays, sandy clays and laminated silts with interbedded layers of organic clays and silts. These sediments lie directly on the shale bedrock which outcrops along the creek.

The shallow groundwater flow map presented on Figure 2 was prepared using water level elevations of October 1986. Vertical groundwater flow is shown schematically on Figure 3. Water level elevations are presented in Table 1.

The groundwater system has been identified at the site. Groundwater is confined in the weathered shale zone which is overlain by relatively impermeable silty clay fill and glacial till deposits and underlain by unweathered shale. Water levels in wells in the weathered shale stabilized an average of 10 ft. higher than the saturated zone tapped by the wells. The saturated weathered shale zone is underlain by gray shale which forms the lower confining layer.

*Perched  
Water  
Flow!*

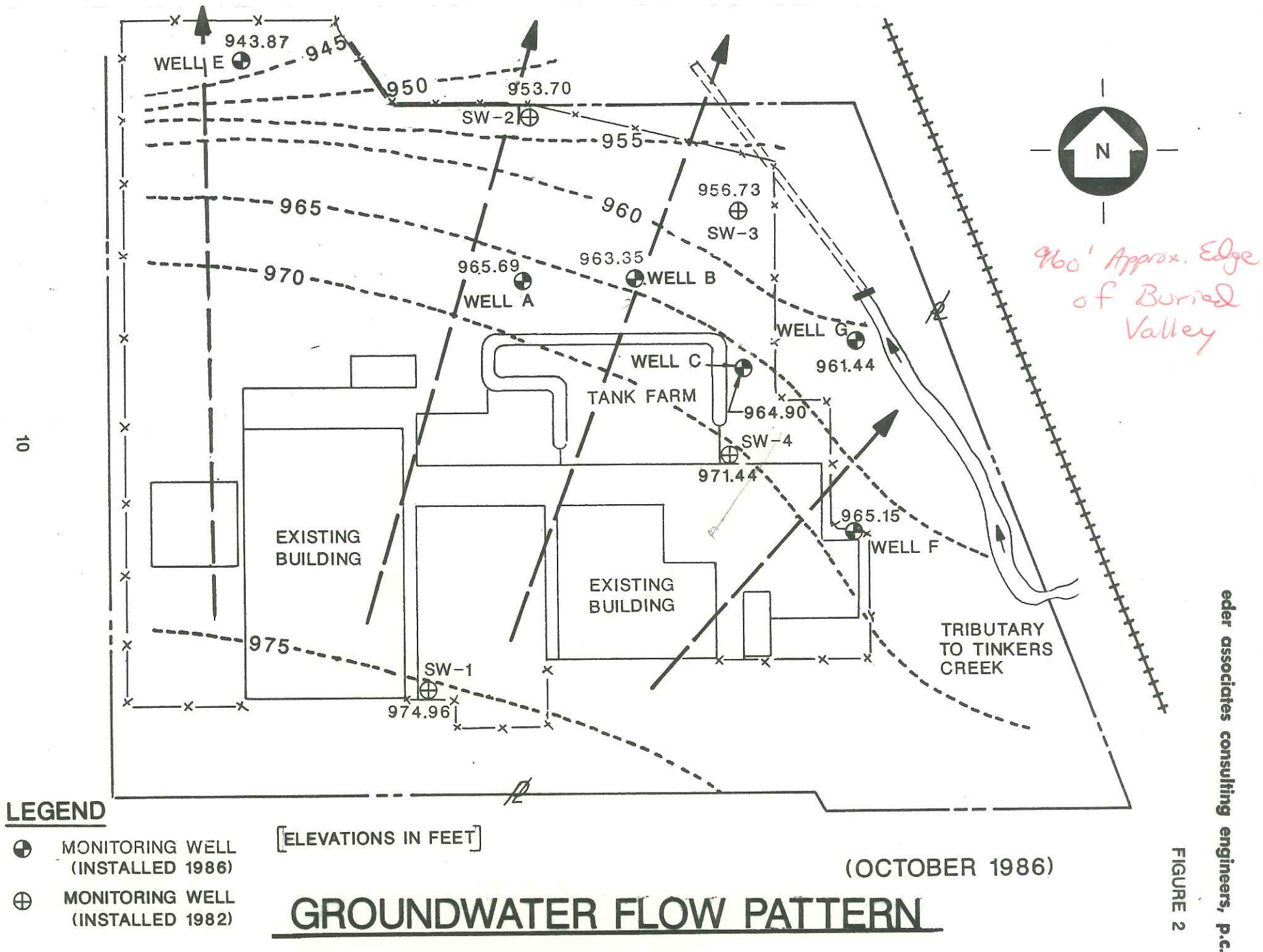
A deep well was planned for the evaluation of the potential for vertical migration of contaminants into the shale bedrock. The deep well was drilled to a depth of 44 ft. and casing was installed to 34 ft. and the bottom 10 ft. remained open. No groundwater was detected in the shale below the saturated fractured and weathered zone. The test well was left open to determine if any water would be produced, but, after one week, the test well remained dry. Based on this data, the shale underlying the site is relatively impermeable with little or no interconnection between fractures. Consequently, downward migration of shallow groundwater is prevented by the shale and it does not enter the underlying Berea or Sharpsville Sandstone aquifers.

*#D*

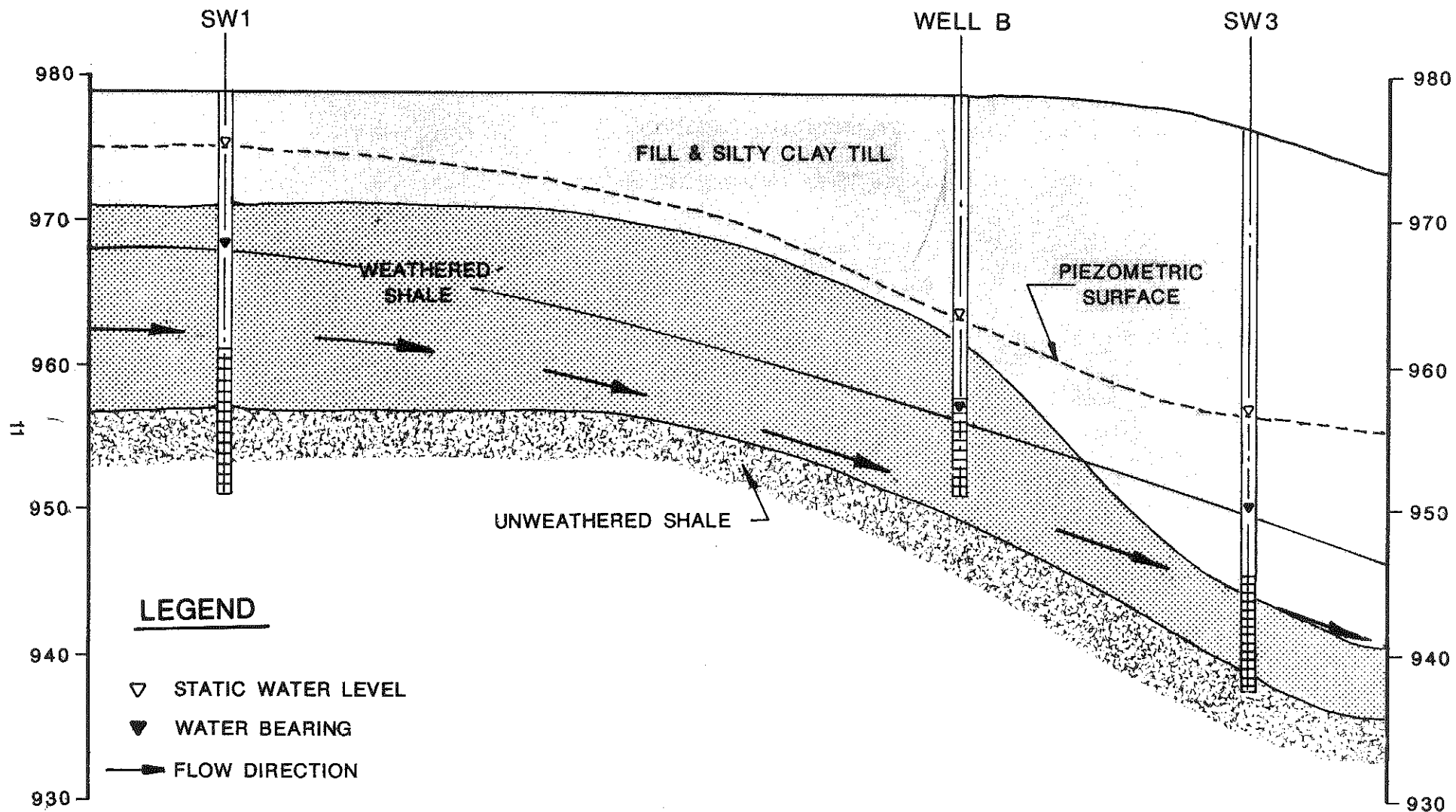
The site investigation results indicate that the groundwater found in the weathered shale under the site is confined to a narrow zone near the till/shale interface. The flow pattern in this zone appears to be lateral into the creek which forms the northern and eastern boundaries of the property.

*How does m.c.  
affect shale!*









VERTICAL GROUNDWATER FLOW PATTERN

HUKILL CHEMICAL CORPORATION  
BEDFORD, OHIO

TABLE 1

WATER LEVEL ELEVATIONS (ft)

Monitor Well	Date					
	September 1982	October 1982	May 1986	September 1986	October 1986	February 1987
SW-1	974.65	975.09	974.06	974.96	--	(NA)
SW-2	952.76	953.00	952.85	--	953.70	953.85
SW-3	956.34	956.48	956.83	956.73	--	955.86
SW-4	969.23	970.86	972.29	971.79	--	971.21
A	(1)	(1)	967.24	965.69	--	966.17
B	(1)	(1)	964.55	963.35	--	963.72
C	(1)	(1)	966.60	964.90	--	965.77
E	(2)	--	--	--	943.87	944.22
F	(2)	--	--	--	965.15	969.12
G	(2)	--	--	--	961.44	961.07

Notes:

1. Wells A, B and C installed in April 1986
2. Wells E, F and G installed in September and October 1986
3. (NA) not accessible

As part of a groundwater quality assessment program at a neighboring site, Egbert Corporation (formerly S.K. Wellman Corporation), three deep and eight shallow wells were installed at depths ranging from 70 to 80 ft. and 10 to 30 ft. respectively. Egbert Corporation retained Woodward-Clyde Consultants to conduct a site investigation for closure of a surface impoundment constructed in 1956 as part of on-site industrial wastewater treatment. Wastewater treatment sludge (Hazardous Waste Code F006) was stored in the impoundment.

*At least 43' Gray Shale*

Results of Woodard-Clyde's site study entitled "Implementation of Egbert Corporation's Groundwater Quality Assessment Program" indicate that, although groundwater was found during air-rotary drilling at depths ranging from 62 to 72 ft., once the deep wells were bailed dry, they did not recover an appreciable amount of water for several months. This, plus the large difference in water elevations between the shallow and deep wells (29 ft.), indicates that the shale underlying both the Hukill and Egbert sites is impermeable and prevents local recharge of the underlying sandstone aquifers.

*msc 095-205*

*Berea SS  
Primary Aquifer*

Groundwater flow at HCC is predominately to the north-northeast toward the alluvial deposits at the creek. Hydrologic gradients increase from 0.022 ft/ft in southern sections of the site to over 0.08 ft/ft in the northern section. Permeabilities of the confining soils have been measured and were found to be very low. Silty till deposits were found to have a permeability of  $2.8 \text{ EE-5 cm/sec}$ , while clayey till samples ranged from  $2.2 \text{ EE-8}$  to  $8.6 \text{ EE-8 cm/sec}$ . A sample from the weathered shale zone was found to have a permeability of  $2.4 \text{ EE-8 cm/sec}$ . Although the absolute permeability of the weathered shale sediments was found to be quite low in the laboratory, this unit is quite permeable overall due to its high incidence of fractures (secondary permeability).

*What about Fill?*

*OK*

The hydraulic conductivity of Wells A and B were measured using the slug "falling head" test method. Slug testing involves either injecting from a well (falling head) or withdrawing (rising head) a

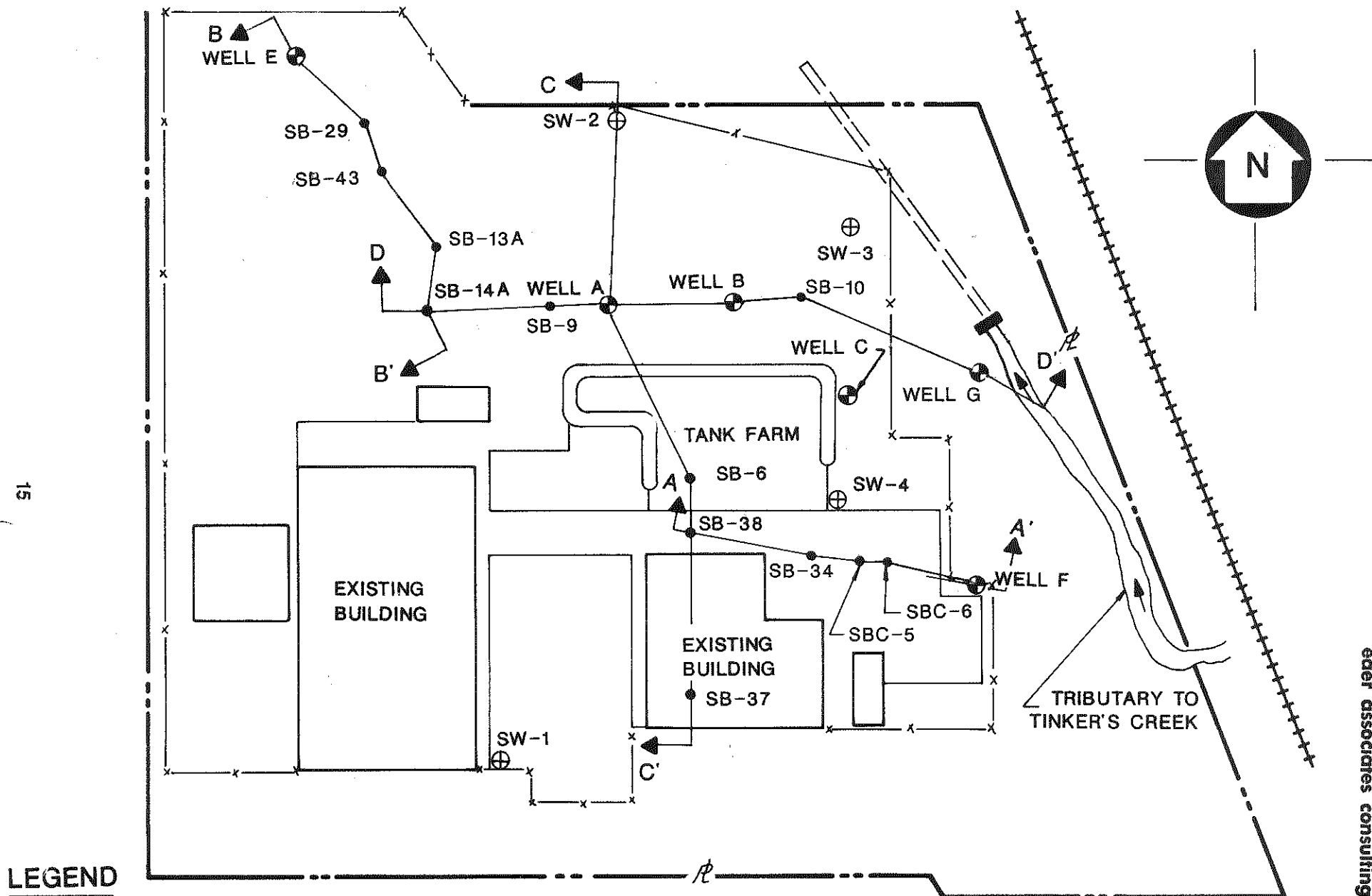
slug of water of known volume. The rate at which the water rises or falls is controlled by the formation characteristics. Based on the results of the tests, with calculations performed according to prescribed methods, the permeability at Well B was estimated to be 4.23 EE-04 cm/sec or 1.2 ft/day. A slug test was also attempted at Well A, however before any water level measurements could be made, the slug of water had already recharged into the formation. Slug tests are only practical for lower permeability materials. Permeability at Well A is assumed to be quite high, since fracturing in the shale is much more pronounced than in Well B. Several "dry holes" were drilled next to holes containing adequate wet seeps which verify the considerable variations in permeability throughout the shallow groundwater zone.

Estimates of groundwater flow rate would be difficult to calculate accurately in the weathered shale zone. The material exhibits changes in hydrologic conductivity due to varying amounts of fracture in the shale. Groundwater flow at the site may be described as occurring between highly fractured zones and zones where there is less fracturing and open pore spaces. The permeability or hydraulic conductivity of this groundwater system is controlled by the number of cracks and fractures present. The groundwater follows these cracks and fractures downgradient to the creek.

Multiple well tests!

What is creek surface elevation?

Drilling conducted at the plant process building, inside the tank farm, and around the cistern revealed a layer of perched groundwater. This water was found in the sandy fill material around underground piping under the east process building of the plant. Perched water was found above impermeable clay till deposits at 2 to 3 ft. below the concrete floor. Water also is present at the surface in the gravel base of the tank farm. It appears that the perched water in the tank farm is connected to the perched water found under the building by sand backfilling around underground plant piping and beneath facility structures (i.e., footings and foundations).

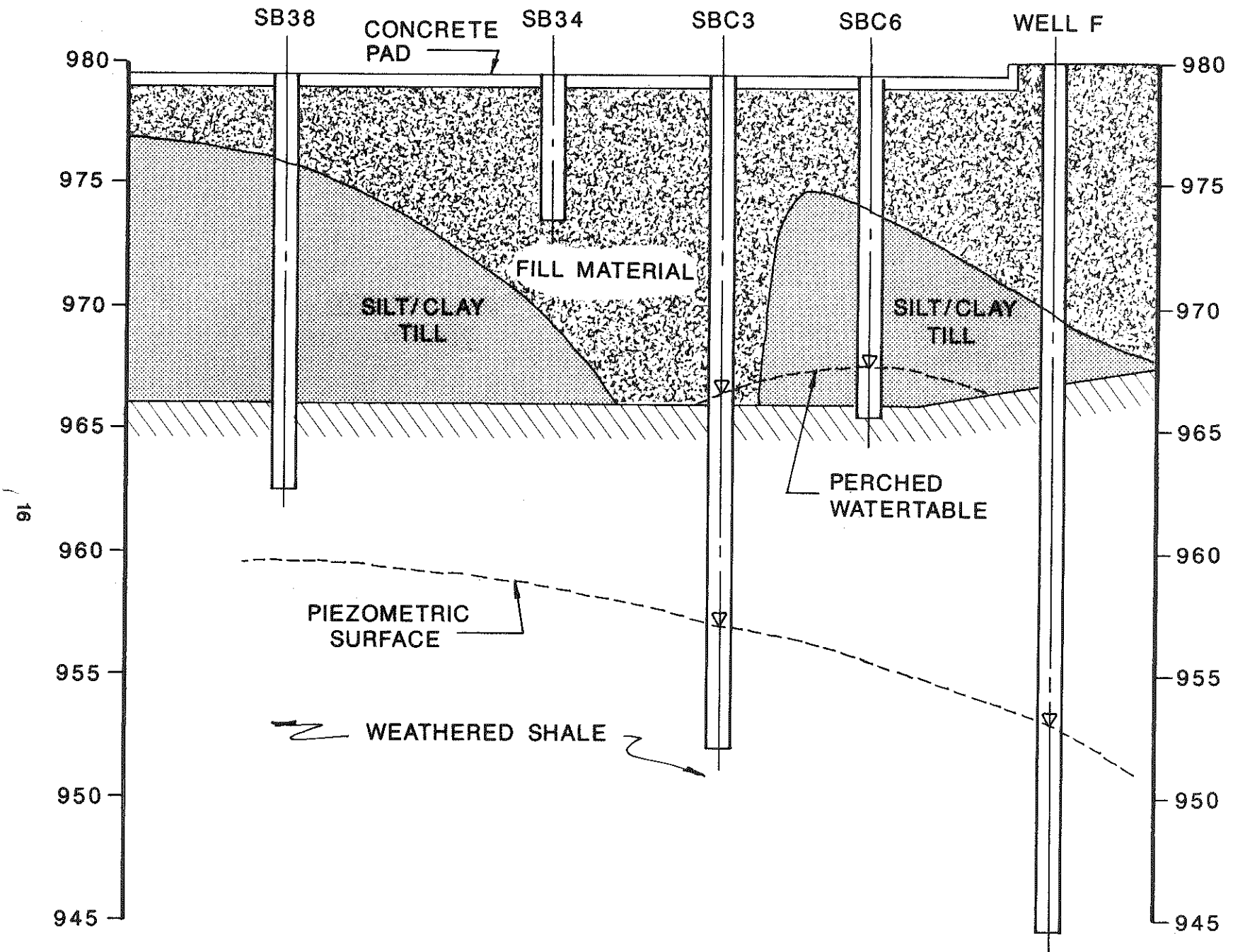


# LEGEND

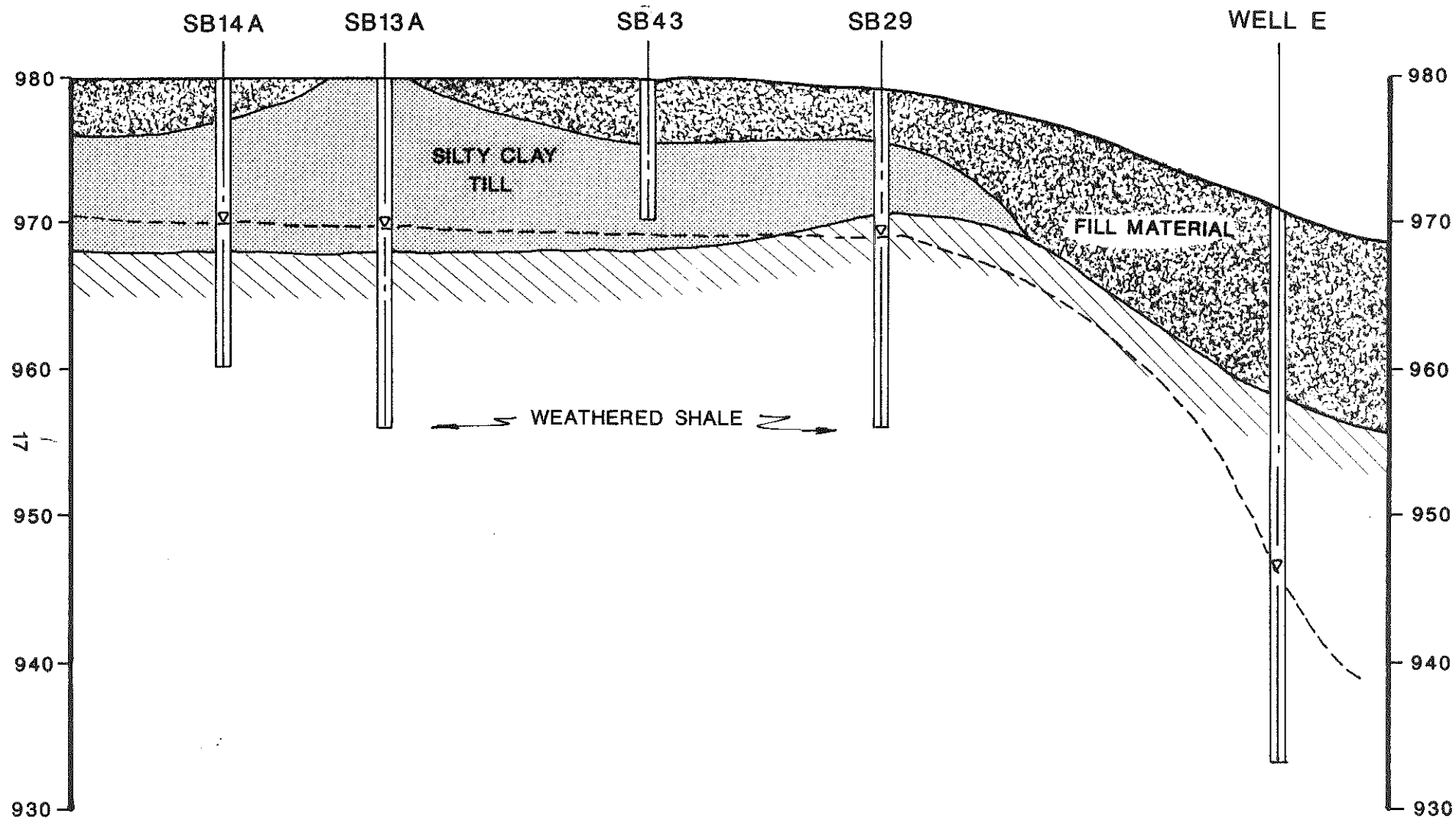
- MONITORING WELL (INSTALLED 1986)
- ⊕ MONITORING WELL (INSTALLED 1982)
- SOIL BORING (SB)

## LOCATION OF CROSS SECTIONS

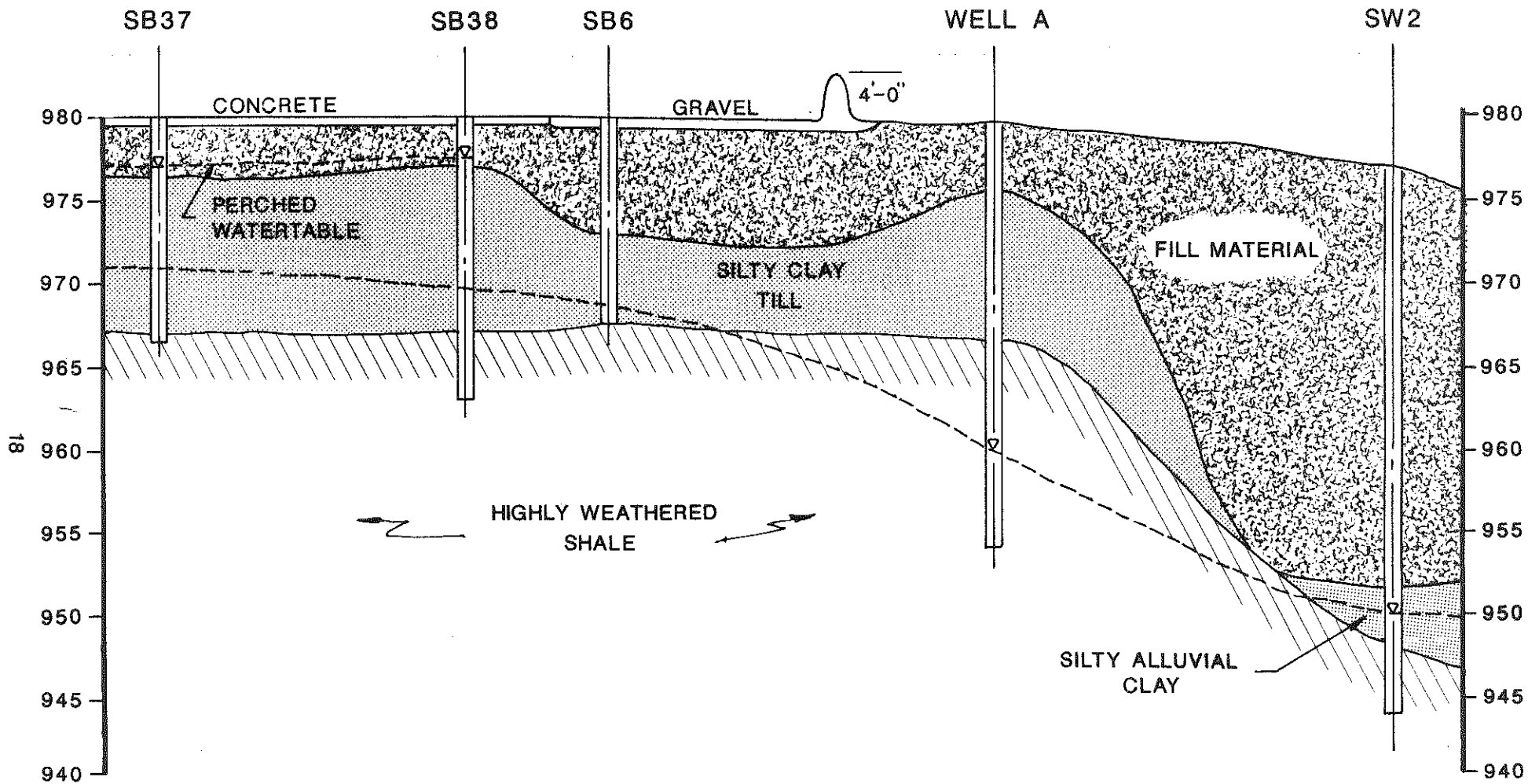




**CROSS SECTION A-A**



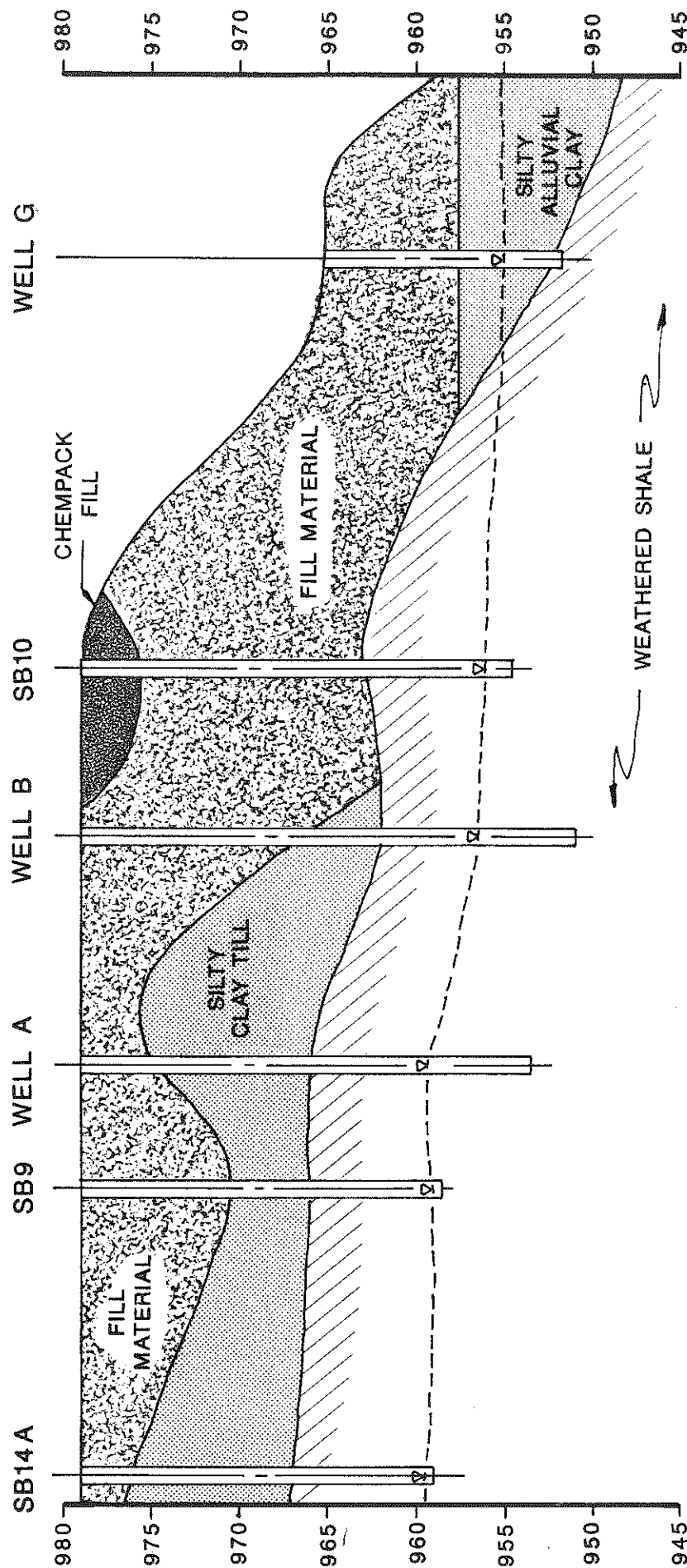
CROSS SECTION B-B



CROSS SECTION C-C



FIGURE 8



## CROSS SECTION D-D

#### 4.0 WELL INSTALLATIONS

Monitor wells were installed in accord with the protocols described in the Quality Assurance and Program Plan of the November 1985 engineering report downgradient of each area of concern. Prior to the current site investigation, four monitor wells SW-1, SW-2, SW-3, and SW-4 were installed under the direction of the NUS Corporation. During 1986, six additional monitor wells, Wells A, B, C, E, F and G were installed by Triggs & Associates, Inc., Willoughby Hills, Ohio under EA's direction.

A 6-1/4 in. I.D., hollow stem auger was used to drill the boreholes and soil samples were taken at 3 ft. intervals with a 1-3/8 in. I.D. split spoon sampler. Blow counts were recorded to aid in identification of soil/strata changes.

Drilling and sampling continued to 5 ft. below the water table at which point the augers were removed from the borehole. It was possible to pull the augers out of the boreholes without cave-ins or collapses. A 2 in. diameter, stainless steel, well casing with 5 ft. of ten slot (0.01) screen was set to bridge 1 ft. above and 4 ft. below the water table. The annular space surrounding the screens was filled with clean, well sorted sand to 1 ft. above the screen. Bentonite seals were installed using a tremie pipe to 2 ft. below grade. Two ft. deep concrete caps were installed at grade. A locking cap was installed on each well.

As-built construction diagrams for each monitor well are shown in Appendix A. Locations of all monitor wells are shown on Figure 1.

The following is a description of each well installed under EA's direction.

Monitor Well A: This well is located downgradient of the west end of the tank farm and monitors groundwater flowing from that area. Continuous split spoon sampling was performed to 4.5 ft., then at 3 ft. intervals. Fill material was encountered to 4 ft. Silt and clay dominated the matrix with little sand and gravel. Glacial till material was found to a depth of 13 ft. Fractured/weathered very fissile and weak gray shale occurred throughout the remainder of the boring. Water was encountered at 19.5 ft. and rose to 12 ft. 24 hours after the boring was completed. The monitor well screen was set from 18.5 ft. to 23.5 ft. The total depth of the boring is 25.5 ft.

Monitor Well B: This well is located east of Well A and monitors groundwater flow through central sections of the tank farm. Fill material contained wood, glass and rubber fragments along with the silt, sand and clay to 12.5 ft below grade. Glacial till extended down to 17 ft., water was encountered at 22.5 ft. from grade in the fractured/weathered shale and rose to 17 ft. upon well completion. The screen was placed between 21.5 ft. and 26.5 ft. below grade. The boring depth is 28 ft.

Monitor Well C: This well is located at the northeast end of the tank farm to intercept groundwater flow through the east end of the tank farm. Gravel, cobbles and sand were found in the upper 5 ft. of the boring. This was underlain by 8 ft. of glacial till. Gray fractured/weathered shale was found at 13 ft. with water occurring 5.5 ft. below the till/shale interface at 18.5 ft. Water rose to 16 ft. upon well completion. The screen was set at 17.5 to 22.5 ft. and the borehole depth is 24 ft.

Proposed Monitor Well D (deep well): The boring for Well D is located adjacent to Monitor Well C, which has shown the highest concentration of volatile organic chemicals. Well D would monitor the vertical movement of groundwater in the aquifer. A 6-1/4 in. hollow stem auger was used to 14 ft. (top of the fractured/weathered shale). Rotary drilling with clean water was used to penetrate the

consolidated shale under the weathered/fractured zone. A 4 in. diameter steel casing was set at 34 ft. with an open hole to 44 ft. The well was bailed dry upon installation and it remained dry over an entire week, at which time it was decided not to install the well. The casing was removed and the borehole was abandoned by filling with cement/bentonite to land surface.

Monitor Well E: This well is located downgradient of the "northwest landfill area" to intercept groundwater moving through this area. During the drilling, sand, brick, glass and foundry slag were encountered to 13 ft. with fractured/weathered gray shale encountered throughout the remainder of the boring. Water was encountered at 32.5 ft. and the screen was set between 32.5 ft. and 37.5 ft. The boring extended to 38.5 ft. Water rose to 28.1 ft. upon well completion.

Monitor Well F: The original location of this well was changed when groundwater was not encountered at 35.5 ft. A new location was chosen 30 ft. to the south of the planned location and groundwater was encountered in the fractured/weathered shale at 24.5 ft. The screen was set between 24 ft. and 29 ft. Water rose to 15.8 ft. upon well completion. This well monitors groundwater flowing downgradient from the container storage area and underground cistern. *No!*

Monitor Well G: This well was installed next to the creek downgradient of the tank farm. Well G was placed to monitor groundwater flow downgradient of the tank at the creek. The well was installed based on first quarter groundwater monitoring data. Water was encountered at 9.5 ft. in gray to black alluvial silt and clay and rose to 6.8 ft. upon boring completion. The screen was set from 7 ft. to 12 ft. below grade. The boring extended down to the fractured/weathered shale at 13.5 ft. Well G was installed in addition to the wells described in the November 1985 and August 1985 engineering reports. The location and installation of Well G was reviewed with the USEPA during the September site work. *Craig*

*More In  
Line with  
Cistern  
Culvert?  
Precludes  
Other location?*

*Problems  
@ C?*



## 5.0 SOIL SAMPLING

Surface and subsurface soil samples were collected in selected areas to define the nature and extent of possible contamination. Drawing No. 1 shows the location of each soil boring/sampling point. All soil sampling procedures were performed in accord with the "Quality Assurance Program Plan" (QAPP) described in EA's, "Plan for Determining the Extent of Potential Contamination", November 1985.

### 5.1 Background Soil Borings

Four background soil borings, SB-13, SB-14, SB-15, and SB-16, were drilled and sampled to establish a reference background to which the other soil samples could be compared. Soil samples from each of these borings were collected at 1.5 ft. intervals from the surface to 4.5 ft. and at 3.0 ft. intervals below 4.5 ft. The background sample for organic analysis was composited from the four background borings. Individual samples for metals analyses were taken from each elevation in each soil boring. The total organic concentration was measured using a portable organic vapor analyzer (OVA) for a composite of soil samples from each background soil boring.

Organic readings above background were found during drilling/sampling of background boring SB-14. As soil samples from SB-13 were composited with samples from SB-14, the entire composite was considered contaminated and it was necessary to re-drill and resample SB-13 and SB-14 in different locations, SB-13A and SB-14A. These borings were drilled to the water table. Borings SB-15 and SB-16 were drilled to shale bedrock (25 ft. and 40 ft.) and groundwater was not encountered in either boring. The OVA readings were 5.0 ppm, 5.0 ppm, 75.0 ppm and 12.0 ppm for borings SB-13A, SB-14A, SB-15 and SB-16 respectively. These readings served as a reference background and soil samples with OVA readings greater than the lowest reference concentration of 5 ppm were considered contaminated.

SB 15  
V 22.5'

## 5.2 Solvent Tank Farm

Fourteen soil borings were drilled in and around the tank farm area. Five borings were drilled inside the tank farm and nine borings around the perimeter of the area. Sampling locations are shown in Figure 9 and Drawing No. 1. Proposed soil borings SB-2 and SB-5 were not drilled, because the equipment could not be set up and operated in a safe manner.

Samples were collected using an 18 inch split spoon sampler. Samples were taken continuously to 4.5 ft., and at 3 ft. intervals thereafter. Sampling continued to the depth of fractured/weathered shale in all borings (12 ft. to 13 ft.). SB-1, SB-9, SB-10, SB-11, SB-12, SB-17 and SB-18 were drilled to the water table.

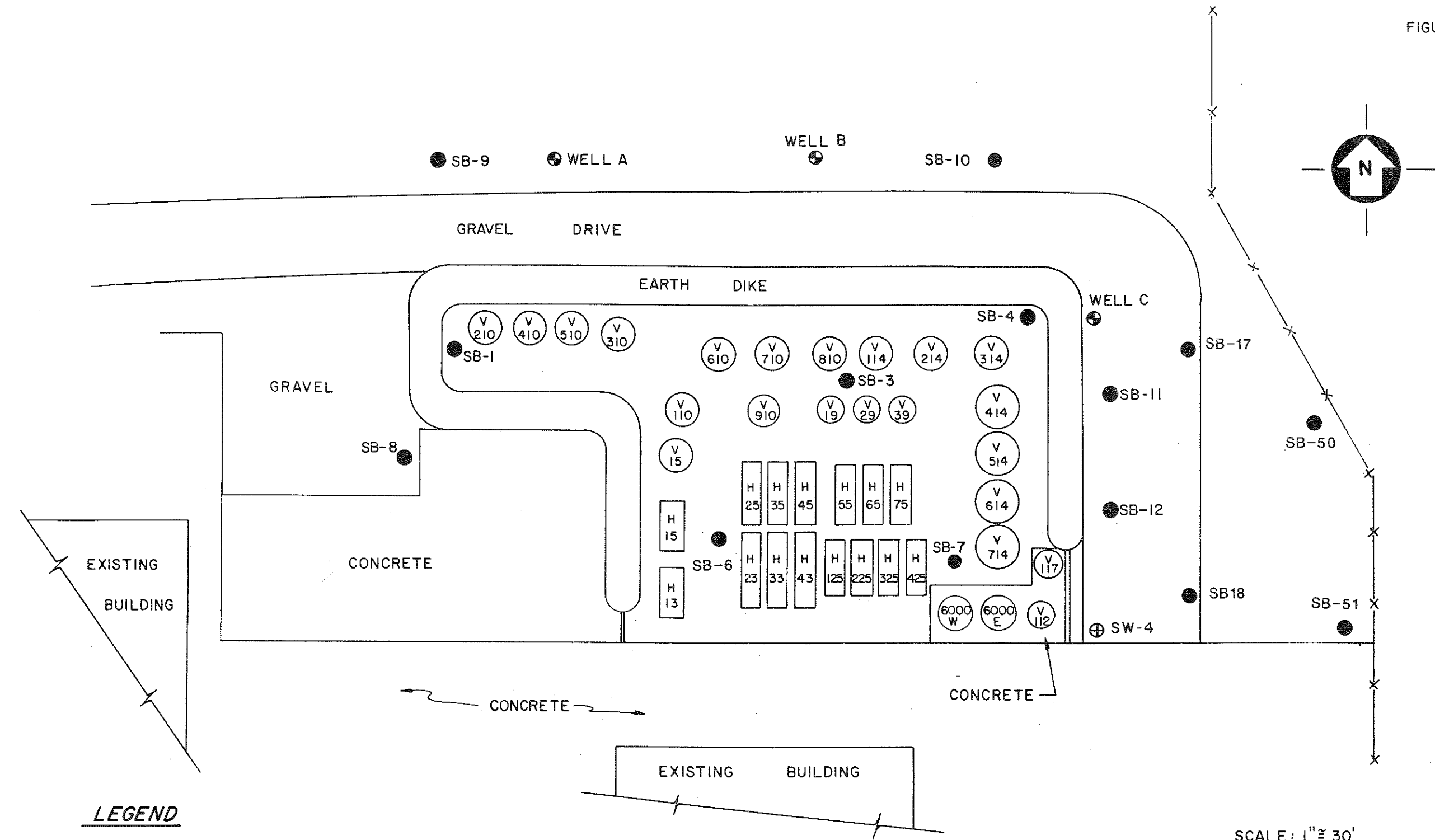
Each sample headspace was screened for total organic vapor content using prescribed OVA screening techniques and samples were selected for laboratory analysis based on these readings. In general, two samples at each boring were taken for analysis; the sample with the highest reading found in the upper unconsolidated deposits and the sample with the lowest reading found in or near the fractured/weathered shale.

## 5.3 "Chem-Pack" Fill Area

Five soil borings were drilled in this area to determine the vertical and areal extent of the "Chem-Pack" fill. These borings were located from a visual inspection of the area. Boring locations are shown on Drawing 1.

At each location, continuous split spoon sampling throughout the vertical extent of the "Chem-Pack" material was completed without augering. On average, the material extended to a 6 ft. depth, with the deepest fill found in SB-21 (15 ft.). Color variations of the "Chem-Pack" were noted with depth. At the surface and through the

FIGURE N° 9



**LEGEND**

- SOIL BORING LOCATION
- ⊙ MONITORING WELL (INSTALLED 1986)
- ⊕ MONITORING WELL (INSTALLED 1982)

**NOTE:**  
STORAGE TANKS SHOWN IN  
APPROX. LOCATION.

**SOIL SAMPLES & WELL LOCATIONS  
IN & AROUND TANK FARM**

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*Iron!*  
first few feet the "Chem Pack" has a rusty, orange-red color. Below the first few feet the material changed to green, white and gray.

In addition to "Chem-Pack" material, soil samples from borings SB-19 and SB-26, contained some black sand (possibly foundry sand). Samples collected from boring SB-25 contained black sand. No "Chem-Pack" was encountered in SB-25. This sand is located on the western edge of the "Chem-Pack" fill area. No black sand fill was found in samples from borings SB-10, SB-20, or SB-21.

Samples of "Chem-Pack" fill material were composited for laboratory analysis. One sample of soil was taken from 1.5 to 3.0 ft. below the fill material in SB-21 to determine if leaching has occurred from the "Chem-Pack" material. A sample of the black "foundry sand" was also sent to the laboratory for analysis.

#### 5.4 Northwest Landfill Area

Six soil borings were drilled and sampled to the depth of split spoon refusal or to groundwater in the northwest corner of the HCC property where construction debris and fill may have been used for site grading. Split spoon samples were taken continuously to 5 ft. and then at 3 ft. intervals. Soil borings are located on Drawing No. 1.

The fill material consisted of glass, brick and gravel along with wood and ash. These materials dominated the upper 2 to 3 ft. of the fill. Foundry sand and slag material were found from the surface down to 23.5 ft. The fill ranged in thickness from 4.5 ft. in SB-29 to 27 ft. in SB-31. Cross section B-B in Section 3.0 of this report shows a southeast - northwest traverse across the area.

One composite sample consisting of samples from soil borings SB-28, SB-29 and SB-30 and one composite consisting of samples from soil boring SB-31, SB-32 and SB-33 were sent to the laboratory for organic and metals analysis. Samples which were anomalous to the fill were



collected and submitted to the laboratory for individual analysis. The anomalous samples showed higher OVA readings than the other fill samples.

### 5.5 Underground Cistern

Soil samples were collected from borings around the cistern made in accord with EA's engineering report, "Closure Plan for Underground Cistern". A total of six soil borings were drilled. Soil borings SBC-1, SBC-2, SBC-3 and SBC-4 were drilled around the walls of the tank. Soil borings SBC-5 and SBC-6 were drilled downgradient of the cistern towards the tributary to Tinkers Creek. Locations of the borings are shown on Drawing No. 1.

A 6-1/4 in. hollow stem auger was used to core through the 6.0 in. of concrete found at grade in the area of the cistern. Continuous split spoon samples were obtained through the augers to 6.5 ft and other samples were collected at 3.0 ft. intervals below 6.5 ft. Split spoon refusal occurred at 13 ft. at the top of the weathered/fractured shale bedrock. The cistern is surrounded by approximately 5 ft. of fill composed of sand, silt and gravel which extends to the shale bedrock. The bottom of the cistern rests on the shale bedrock. Soil borings SBC-5 and SBC-6 encountered fill material to a depth of 5.5 to 6.0 ft. below grade. Below this fill is a silty, sandy till which lies above the weathered/fractured shale bedrock found at a depth of 13 ft. Perched water was found above the shale bedrock at 12 to 13 ft. below grade in samples from borings SBC-3 and SBC-6.

Several soil borings were completed inside the plant building and in the aisle between the tank farm and the building. SB-36, SB-36A and SB-37 were drilled inside the building. Borings SB-34 and SB-38 were drilled in the center of the aisle between the tank farm and the plant process building. Boring SB-35 was drilled to the south of the cistern. Specific locations for the borings are shown on Drawing No. 1.

Sandy fill material was found surrounding the underground piping beneath the facility. The fill extended an average depth of 3.5 ft and rested on the clay till. Borings SB-37 and SB-38 were drilled into shale bedrock which occurred at 13 ft. Perched water was found on top of the impermeable clay till deposits in borings SB-36, SB-36A, SB-37 and SB-38 at 2 to 3 ft. below the concrete floor. Perched water accumulated in borings SB-36, SB-36A and SB-37 and was collected and submitted to the laboratory for organic analysis. Accumulation of perched water did not occur at boring SB-38 and therefore no liquid sample could be collected for analysis.

#### 5.6 Neutralization Pits

It was originally planned to locate the two neutralization pits by boring on a grid pattern. However, a visual inspection found two rectangular areas with sparse vegetation. Plant personnel and subsequent soil sampling confirmed that these areas were in the immediate vicinity of the former neutralization pits.

Two soil borings were drilled in each neutralization pit; SB-39 and SB-40 in the west neutralization pit and SB-41 and SB-42 in the east neutralization pit. Locations of the soil borings are shown on Drawing No. 1. A continuous split spoon sample was taken from 4.5 to 7 ft. below the bottom of each pit (refer to boring logs in Appendix A.) Samples were collected for analysis at the surface (0 to 3.0 ft.); at the bottom of the pit (4.5 to 6.0 ft.); and from below the pit at (9.5 to 11.0 ft.).

#### 5.7 API Tank Basin/No Free Liquid Container Storage Area

Two soil borings were drilled to the east of the API tank basin (SB-50 and SB-51). Four soil borings were drilled and one well was installed around the perimeter of the container storage area (SB-46, SB-47, SB-48, SB-49 and Well F). Soil samples were collected from each boring including the Well F borehole. Locations of each soil boring and Well F are shown on Drawing No. 1.

Continuous samples were collected with a split spoon sampler to 5.0 ft. Subsequent samples were taken at 3.0 ft. intervals. All samples were screened with the OVA.

Borings around the API tank basin showed sand and gravel fill material ranging in depth from 2.0 to 8.0 ft. below grade. Clay till underlies the fill material and rests on top of the fractured/weathered shale. Groundwater was found in the weathered shale from 20 to 27 ft. below grade. Borings around the container storage area show a similar subsurface profile. Drilling extended to a depth where background OVA readings were reached.

Well F was not installed in its originally proposed location because drilling continued to 35.5 ft. without encountering a saturated zone. It was determined that there was no groundwater flow at this location and Well F was relocated and installed in soil boring SB-46 where groundwater was encountered at 24.5 ft.

## 6.0 RESULTS OF INVESTIGATION

This section provides a unit by unit summary of the results of the sampling conducted at the various waste management units at the HCC facility. Laboratory reports are provided in Appendix C in the same order as the results are presented in this section.

### 6.1 Sample Analyses

Soil samples were submitted for analyses in accord with EA's November 1985 and August 1986 engineering reports. A summary of the chemical analytes is provided in Tables 2 and 3. Detection limits for the parameters are not shown in the tables because the limits will vary on a sample by sample basis in accord with the concentration ranges of the parameters present. Specific detection limits for a given sample are included Appendix C.

Sampling and analysis was performed in accordance with the Quality Assurance Program Plan (QAPP) described in the November 1985 engineering report. Organic analyses of samples were performed by NUS Corporation, Laboratory Services Division, Pittsburgh, Pennsylvania. Analyses of inorganic parameters were conducted by Wilson Laboratories, Salina, Kansas. Both are USEPA contract laboratories.

Laboratory Quality Assurance/Quality Control (QA/QC) was performed in accord with the USEPA's Contract Laboratory Program (CLP) protocol which includes blank, duplicate and spike samples. Field QA/QC protocols included field blanks and duplicates on 10 percent of each sample matrix. Laboratory QA/QC analytical results are provided in Appendix C. A summary of the organics detected in the method blanks and their concentration ranges is provided in Tables 4 and 5. The method blank organic results are divided into low level and medium level concentrations. Method blank results for metals are summarized in Table 6.

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TABLE 2

SUMMARY OF ORGANIC ANALYTES<sup>(1)</sup>

Chloromethane  
Bromomethane  
Vinyl Chloride  
Chloroethane  
Methylene Chloride (Dichloromethane)  
Acetone  
Carbon Disulfide  
1,1-Dichloroethylene  
1,1-Dichloroethane  
Trans-1,2-Dichloroethylene  
Chloroform  
1,2-Dichloroethane  
2-Butanone (Methyl Ethyl Ketone)  
1,1,1-Trichloroethane  
Carbon Tetrachloride  
Vinyl Acetate  
Bromodichloromethane  
1,2-Dichloropropane  
Trans-1,3-Dichloropropylene  
Trichloroethylene  
Dibromochloromethane  
1,1,2-Trichloroethane  
Benzene  
cis-1,3-Dichloropropylene  
2-Chloroethylvinylether

Table 2 Continued . . .

Bromoform  
 4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)  
 2-Hexanone (Methyl Butyl Ketone)  
 Tetrachloroethylene  
 1,1,2,2-Tetrachloroethane  
 Toluene  
 Chlorobenzene  
 Ethylbenzene  
 Styrene  
 Total Xylenes  
 Ethanol  
 Isopropyl Alcohol  
 Isobutanol  
 Isopropyl Ether (2-2' oxybispropane)  
 Butyl Acetate  
 Ethyl Acetate  
 Aliphatic Hydrocarbons

*Methanol?*

NOTES:

1. These analytes are the volatile organic compounds listed on the USEPA's Hazardous Substance List (HSL) or that are identified by a spectra library search. Compounds were analyzed by GC/MS using a purge and trap technique. This list does not include all volatile organic compounds detectable via the spectra library search. Where compounds were detected via the library search, their concentrations are provided in the results of this report.
2. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory results in Appendix C.

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TABLE 3

SUMMARY OF METAL ANALYTES

Arsenic  
Barium  
Cadmium  
Chromium (T)  
Copper<sup>(1)</sup>  
Iron<sup>(1)</sup>  
Lead  
Mercury  
Nickel<sup>(1)</sup>  
Selenium  
Silver

NOTES:

1. These metals were run on neutralization pit and Chem-Pack samples.

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TABLE 4

SUMMARY OF METHOD BLANK RESULTS  
LOW LEVEL ORGANIC ANALYSES

<u>Parameter</u>	<u>Matrix</u>	
	<u>Water (ug/l)</u>	<u>Soil (ug/kg)</u>
✓ Methylene Chloride	2-9	4-19
✓ Acetone	2-28	3-29
✓ 2-Butanone	15	2-6
1,1,1-Trichloroethane	LD	2-3
Toluene	LD	1-2
✓ 1,1,2-Trichloro		
-1,2,2-Trifluoroethane	20	8-20
4-Methyl-2-Pentanone	6	2-6
Trimethylsilanol	LD	2-10
2-Hexanone	9	LD

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the sample specific detection limits.



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TABLE 5

SUMMARY OF METHOD BLANK RESULTS  
MEDIUM LEVEL ORGANIC ANALYSES

<u>Parameter</u>	<u>Soil Matrix (ug/kg)</u>
Methylene Chloride	790-1800
Acetone	1100-4400
2-Butanone	2500-4900
1,1,2-Trichloro	
-1,2,2-Trifluoroethane	2000

NOTES:

1. There were no medium level organic analyses of water samples.

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TABLE 6

SUMMARY OF METHOD BLANK RESULTS  
METALS ANALYSES

<u>Parameter</u>	<u>Concentration</u>
Arsenic	LD
Barium	LD
Cadmium	LD
Chromium	LD
Copper	LD
Iron	LD
Lead	LD
Manganese <sup>(2)</sup>	LD
Mercury	LD
Nickel	LD
Selenium	LD
Silver	LD
Zinc <sup>(2)</sup>	LD

NOTES:

1. LD indicates less than the detection limit. Refer to the laboratory reports in Appendix C for the specific sample detection limit.
2. These parameters were analyzed on select samples in addition to those required by the Site Investigation engineering reports.

As part of the field QA/QC, a sample of the final rinse water used to decontaminate equipment was collected. The results of analyses are presented in Tables 7 and 8.

Field blank and duplicate analyses are presented with the sampling results in the following subsections.

## 6.2 Background Soil Samples

Samples collected from the four background soil borings (SB-13A, SB-14A, SB-15 and SB-16) were composited into one sample for organics analysis. The results of the organic analyses are shown in Table 9. Trace quantities of organics were detected in a background sample. However, five of the seven organic chemicals detected were also detected in laboratory's blank samples. Methylene chloride and acetone are known common laboratory contaminants. The remainder of the organic chemicals were detected at or near the detection limit required by the contract laboratory program (Contract Required Detection Limit, CRDL).

The background soil samples analyzed for metals were collected at the following depths in each boring and submitted for individual analyses:

0 to 1.5 ft.  
7.5 to 9 ft.  
12 to 13.5 ft.

These sampling depths were selected to coincide with the sampling depths around the cistern in order to obtain the data needed to perform the Student's "t" test of metals concentrations in the soil around the cistern and in background samples as required by OEPA. The results of the background metals analyses are provided in Tables 10, 11 and 12.

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TABLE 7

FINAL RINSEWATER  
ORGANIC ANALYSES

<u>Parameter</u>	<u>Concentration (mg/l)</u>
Methylene Chloride	0.001 (J)
Chloroform	0.027
Bromodichloromethane	0.008
TOC	2.7
TOX	LD

NOTES:

1. J indicates compound identified at a concentration estimated below the detection limit.
2. LD indicates less than the detection limit. Detection limits are sample specific due to the concentration ranges of organics in samples. For the detection limit of a specific compound refer to the laboratory results in Appendix C.

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TABLE 8

FINAL RINSEWATER  
METALS ANALYSES

<u>Parameter</u>	<u>Concentration (mg/l)</u>
Arsenic	LD
Barium	LD
Cadmium	LD
Chromium (T)	LD
Lead (R)	LD
Mercury	LD
Selenium (R)	LD
Silver (R)	LD

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to the concentration ranges of organics in samples. For the detection limit of a specific compound refer to the laboratory results in Appendix C.
2. (R) indicates spike sample recovery was not within control limits.

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TABLE 9

BACKGROUND SOIL SAMPLE  
ORGANIC ANALYSES

Sample Location	See Note 1
Sample Number	SS-1
Sample Depth	See Note 1
Parameter (ug/kg)	
Methylene Chloride	10 <sup>2</sup>
Acetone	48 <sup>2</sup>
2-Butanone	8 (J) <sup>2</sup>
1,1,1 Trichloroethane	6 <sup>2</sup>
4-Methyl-2-Pentanone	7 <sup>2</sup>
Toluene	6
Xylene	5 (J)
Total VOCs	90

NOTES:

- Sample No. SS-1 is a composite of samples collected from soil borings SB-13A, SB-14A, SB-15 and SB-16 at intervals between the following depths:  

SB-13A	- - - - -	0-24.5 ft.
SB-14A	- - - - -	0-20 ft.
SB-15	- - - - -	0-39.7 ft.
SB-16	- - - - -	0-19.5 ft.
- Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory results in Appendix C.
- (J) indicates compound identified at a concentration estimated below the detection limit.

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TABLE 10

BACKGROUND SOIL BORING SAMPLES  
METALS ANALYSES

Sample Location	SB-13A	SB-13A	SB-13A	SB-14A	SB-14A	SB-14A	SB-15	SB-16
Sample Number	SSM-29	SSM-29D	SSM-29B	SSM-37	SSM-37D	SSM-37B	SSM-16	SSM-44
Sample Depth (ft)	0-1.5	0-1.5	--	0-1.5	0-1.5	--	0-1.5	0-1.5
Parameter (mg/kg)								
Arsenic	13.0	17.0	LD	17.0	21.0	LD	19.0	8.2
Barium	91.0	183.0	LD	105.0	86.0	LD	107	159.0
Cadmium	3.6	4.3	LD	5.8	5.2	LD	LD	LD
Chromium	22.0	17.0	LD	LD	LD	LD	22.0	26.0 (R)
Lead	132.0	145.0	LD	103 (R)	104 (R)	LD (R)	85.0	116.0 (*)
Mercury	LD	LD	LD	LD	LD	LD	LD	LD
Selenium	LD	LD	LD	LD	LD	LD	LD	LD
Silver	LD	LD	LD	LD	LD (R)	LD (R)	LD	LD

*+ Ba, Pb in surface.*

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the specific sample detection limit.
2. (R) indicates spike sample recovery was not within control limits.
3. (\*) indicates duplicate analysis was not within control limits.
4. (D) indicates duplicate analysis.
5. (B) indicates blank analysis.



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TABLE 11

BACKGROUND SOIL BORING SAMPLES  
METALS ANALYSES

Sample Location	SB-13A	SB-14A	SB-15	SB-16
Sample Number	SSM-32	SSM-40	SSM-19	SSM-47
Sample Depth (ft)	7.5-9.0	7.5-9.0	7.5-9.0	7.5-9.0
Parameter (mg/kg)				
Arsenic	15.0	17.0	13.0	LD
Barium	LD	40.0	46.0	LD
Cadmium	4.0	4.0	LD	4.6
Chromium	19.0	14.0	18.0	18 (R)
Lead	10.0	17.0 (R)(S)	18.0	18 (*)
Mercury	LD	LD	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	LD	LD (R)	LD	LD

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the specific sample detection limit.
2. (S) indicates concentration determined by the method of standard addition.
3. (\*) indicates duplicate analysis was not within control limits.

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TABLE 12

BACKGROUND SOIL BORING SAMPLES  
METALS ANALYSES

Sample Location	SB-13A	SB-14A	SB-15	SB-16
Sample Number	SSM-33	SSM-41	SSM-20	SSM-48
Sample Depth (ft)	12.0-13.5	12.0-13.5	12.0-13.5	12.0-13.5
Parameter (mg/kg)				
Arsenic	13.0	9.9	15.0	LD
Barium	LD	LD	LD	LD
Cadmium	4.4	LD	3.1	4.8
Chromium	21.0	LD	20.0	20.0 (R)
Lead	3.3	12.0 (R)	23.0	LD (*)
Mercury	LD	LD	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	LD	LD (R)	LD	LD

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the specific sample detection limit.
2. (R) indicates spike sample recovery was not within control limits.
3. (\*) indicates duplicate analysis was not within control limits.

### 6.3 Solvent Tank Farm

Soil samples were collected from borings drilled in and around the solvent tank farm. Results of laboratory analyses are presented in this section in tabular form. A graphic representation of total volatile organics is shown in the tank farm cross sections. Figure 10 shows the locations of the cross sections.

Tables 13, 14 and 15 present the organic analyses of soil samples collected between 1.5 to 17.5 ft. below grade in the northern area of the tank farm. The results are shown in cross section "A-A", Figure 11. The total VOC concentrations range from 0.021 mg/kg to 969.0 mg/kg

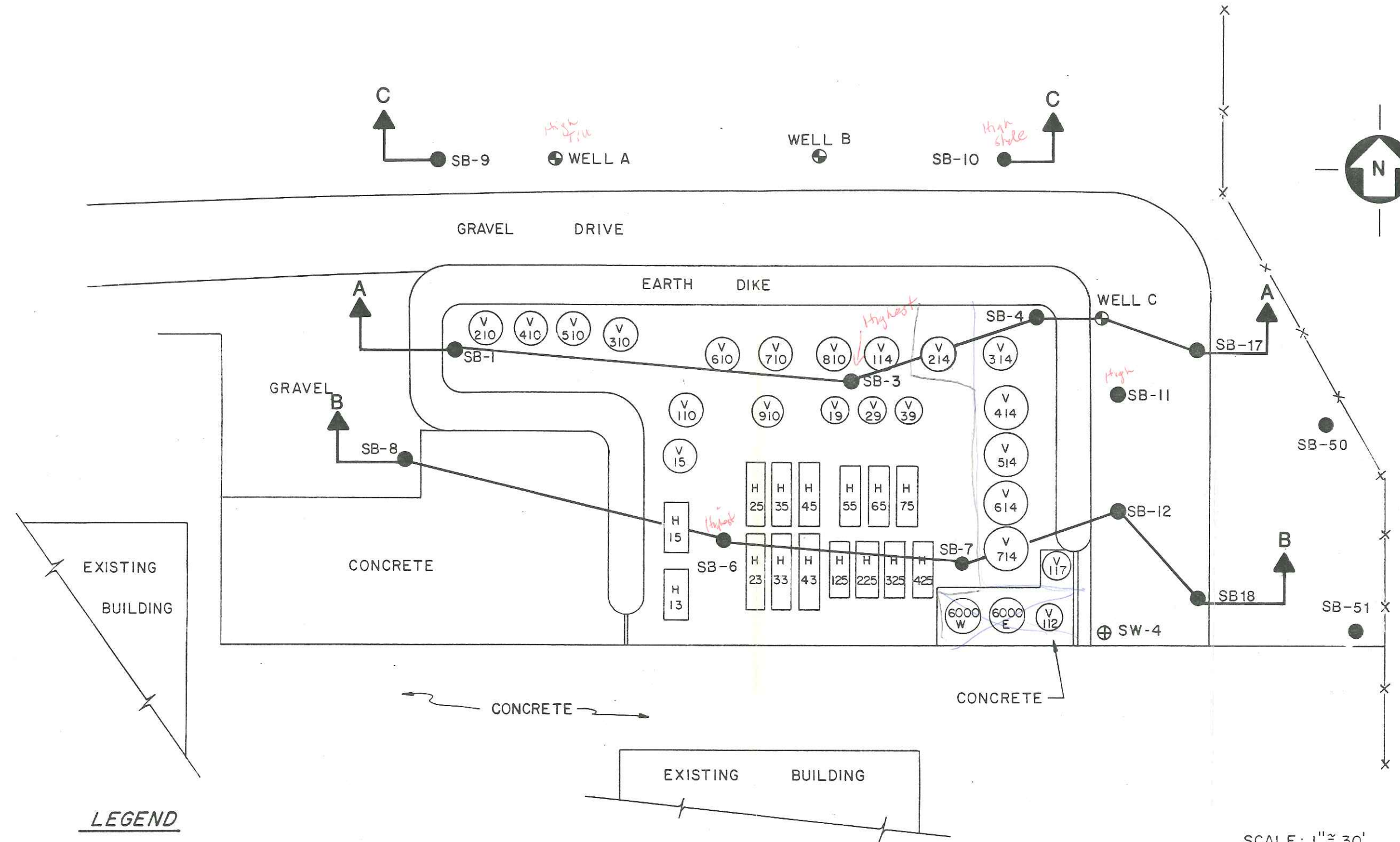
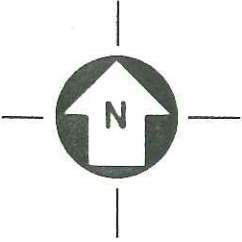
Organic analytical results of soil samples collected between 1.5 to 24.0 ft. below grade inside and outside the southern portion of the tank farm are shown in Tables 16 and 17. The results are shown in cross section "B-B", Figure 12. The total organic concentrations range from 0.454 mg/kg to 1006 mg/kg. SB-18 is located in the vicinity of the french drain which is connected to the API holding tank.

Table 18 shows the results of organic analyses of soil samples collected from borings drilled approximately 30 foot to the north of the solvent tank farm berm. These results are shown in cross section "C-C", Figure 13. Only two samples collected from the four borings north of the tank farm contained elevated levels of VOCs. A sample collected from the Well A borehole between 7.5 to 9.0 ft. contained a total VOC concentration of 49.72 mg/kg. A second soil sample containing an elevated level of VOCs was collected from boring SB-10 at 19.0 to 20.0 ft. This sample contained 43.1 mg/kg of total VOCs. The remaining samples collected from the soil borings to the north of the tank farm contained low levels of VOCs.

Three soil samples, collected in and around the tank farm, which showed the highest VOC concentrations were selected for total metals

*Associated with Solvent Farm*

FIGURE N° 10



LEGEND

- SB-SOIL BORING
- ⊕ MONITORING WELL (INSTALLED 1986)
- ⊕ MONITORING WELL (INSTALLED 1982)

NOTE:  
STORAGE TANKS SHOWN IN  
APPROX. LOCATION.

SCALE: 1" = 30'

CROSS SECTION LOCATIONS  
IN & AROUND TANK FARM

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TABLE 13

TANK FARM SOIL SAMPLING  
ORGANIC ANALYSES

Sample Location	SB-1	SB-3	SB-4	SB-4	SB-4	Well C	SB-11	SB-17
Sample Number	SS-158	SS-165	SS-176	SS-176 Dup.	SS-176 Blank	SS-66	SS-93	SS-108
Sample Depth (ft)	1.5-3.0	3.0-4.5	1.5-3.0	1.5-3.0	NA	3.0-4.5	1.5-3.0	1.5-3.0
Parameter (mg/kg)								
Methylene Chloride	0.810 (J)	4.3	2.5	4.0	0.031	4.6	13.0	0.093
Acetone	5.9	8.5	5.6	4.1	0.055	7.4	11.0 (J)	0.074
2-Butanone	11.0	8.3	7.7	7.1	LD	3.2	LD	LD
Tetrachloroethylene	LD	2.1	2.2	0.990	LD	LD	15.0	0.007 (J)
Toluene	LD	LD	0.720	0.790	LD	1.4	330.0	LD
Ethyl Benzene	LD	LD	1.7	1.8	LD	1.3	110.0	LD
Total Xylene	5.2	LD	8.8	9.3	LD	6.3	490.0	LD
1,1,2-Trichloro-								
1,2,2-Trifluoroethane	LD	LD	LD	LD	0.020 (J)	LD	LD	0.100 (J)
Trimethylsilanol	LD	LD	LD	LD	0.007 (J)	LD	LD	LD
1,2,3-Trimethyl Benzene	LD	LD	LD	LD	LD	4.0 (J)	LD	LD
1-Ethyl-2-Methyl Benzene	LD	LD	LD	LD	LD	3.0 (J)	LD	LD
Tetrahydrofuran	LD	LD	LD	LD	LD	LD	LD	0.010 (J)
Total VOCs	22.91	23.2	29.22	28.08	0.113	31.2	969.0	0.284
OVA Reading (ppm)	200	GT1000	1000	---	---	GT1000	GT1000	8.5

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Dup. indicates duplicate analyses
4. GT indicates greater than.

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TABLE 14

TANK FARM SOIL SAMPLING  
ORGANIC ANALYSES

Sample Location	SB-1	SB-1	SB-1	SB-3	SB-4	SB-4	Well C
Sample Number	SS-162	SS-162 Dup.	SS-162 Blank	SS-167	SS-179	SS-179 RA	SS-70
Sample Depth (ft)	16.5-17.0	16.5-17.0	NA	12.0-13.5	12-13.5	12-13.5	16.0-17.5
Parameter (mg/kg)							
Methylene Chloride	0.260	0.480	0.031	29.0	58.0	110.0	21.0
Acetone	0.940	0.620	0.017	52.0	17.0	26.0	4.1
1,1-Dichloroethane	LD	LD	LD	LD	LD	LD	0.300 (J)
2-Butanone	0.044	0.072	LD	36.0	6.2	8.3	5.2
1,1,1-Trichloroethane	0.031	0.110	LD	42.0	LD	8.6	LD
Trichloroethylene	LD	0.026 (J)	LD	LD	LD	6.1	LD
Tetrachloroethylene	LD	0.062	LD	800.0	LD	LD	LD
Toluene	0.028	0.081	LD	32.0	LD	LD	4.5
Ethyl Benzene	LD	0.006 (J)	LD	LD	LD	LD	0.440 (J)
Total Xylene	0.006 (J)	0.015 (J)	LD	LD	LD	LD	2.0
1,1,2-Trichloro- 1,2,2-Trifluoroethane	0.200 (J)	0.200 (J)	0.020 (J)	LD	LD	LD	LD
Chloroform	LD	LD	LD	LD	LD	LD	LD
4-Methyl-2-Pentanone	LD	LD	LD	LD	LD	LD	LD
Total VOCs	1.509	1.672	0.068	991	81.2	159	37.54
OVA Reading (ppm)	3.0	---	---	GT 1000	GT 1000	---	GT 1000

NOTES:

- LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
- (J) indicates compound identified at a concentration estimated below the detection limit.
- RA indicates reanalysis. Sample SS-179 was reanalyzed. Samples SS-179 and SS-179 RA had low volatile organic analysis (VOA) surrogates for Toluene-D8 and Bromofluorobenzene. This indicates matrix interference. See "Water Surrogate Percent Recovery" in Appendix C.
- NA indicates not applicable
- Dup. indicates duplicate analyses
- GT indicates greater than.

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TABLE 15

TANK FARM SOIL SAMPLING  
ORGANIC ANALYSES

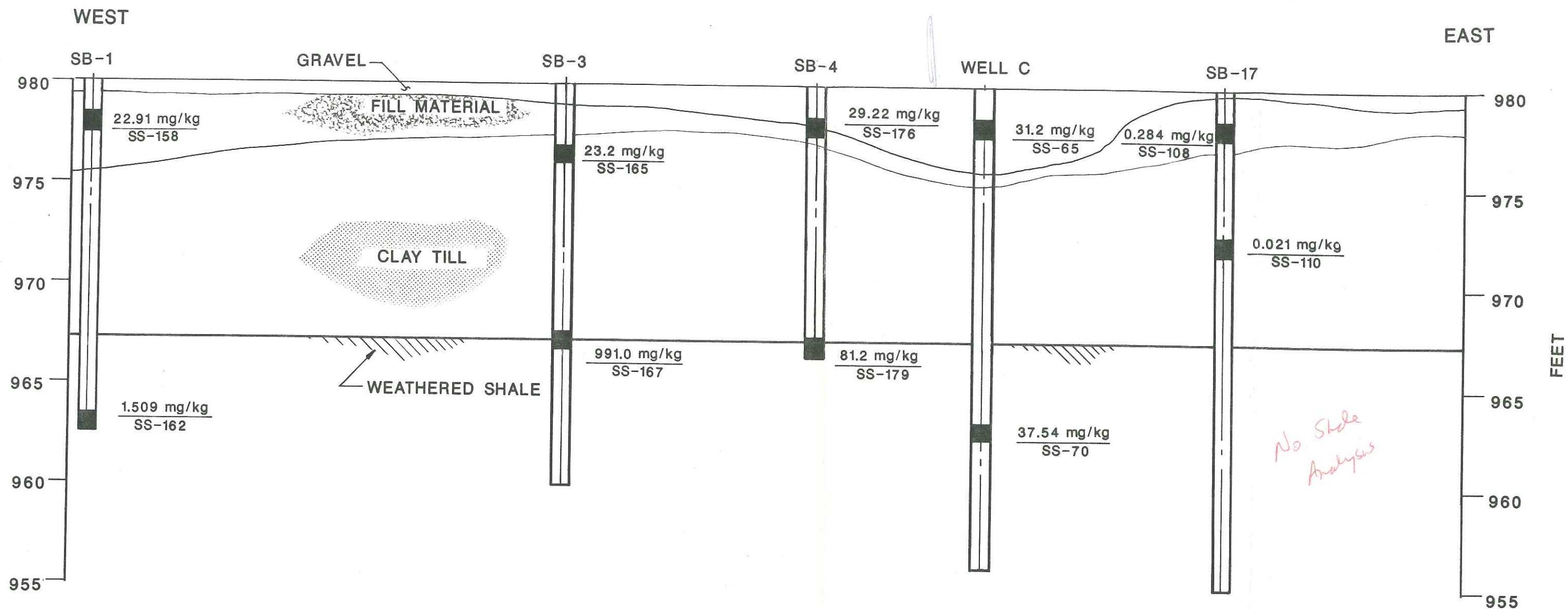
Sample Location	Well C	Well C	SB-11	SB-11	SB-11	SB-11	SB-17
Sample Number	SS-70 Dup.	SS-70 Blank	SS-96	SS-96 RA	SS-96 Dup.	SS-96 Blank	SS-110
Sample Depth (ft)	16.0-17.5	NA	12-13.5	12-13.5	12-0-13.5	NA	7.5-9.0
Parameter (mg/kg)							
Methylene Chloride	16.0	0.015	3.7	1.6 (J)	1.7	0.015	0.015
Acetone	2.8	0.002 (J)	13.0	5.4 (J)	1.7	0.005 (J)	0.006 (J)
1,1-Dichloroethane	0.300 (J)	LD	LD	LD	LD	LD	LD
2-Butanone	3.2	0.003 (J)	3.9	8.3	2.7	0.002 (J)	LD
1,1,1-Trichloroethane	LD	LD	LD	LD	0.390 (J)	LD	LD
Trichloroethylene	LD	LD	LD	LD	LD	LD	LD
Tetrachloroethylene	0.320 (J)	LD	2.2 (J)	1.4 (J)	1.1 (J)	LD	LD
Toluene	10.0	LD	54.0	32.0	25.0	0.001 (J)	LD
Ethyl Benzene	0.720	LD	25.0	15.0	12.0	LD	LD
Total Xylene	3.3	LD	110.0	70.0	51.0	LD	LD
1,1,2-Trichloro-							
1,2,2-Trifluoroethane	LD	LD	LD	LD	LD	LD	LD
Chloroform	LD	0.001 (J)	LD	LD	LD	LD	LD
4-Methyl-2-Pentanone	LD	LD	LD	2.8 (J)	1.4 (J)	LD	LD
Styrene	LD	LD	LD	LD	LD	0.003 (J)	LD
Total VOCs	36.64	0.021	211.8	136.5	96.99	0.026	0.021
OVA Reading (ppm)	---	---	+1000	---	---	---	15.4

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. NA indicates not applicable
4. Dup. indicates duplicate analyses
5. Sample number SS-96 was reanalyzed (SS-96 RA) because VOA surrogates were outside QC limits. Sample SS-96 RA surrogates were within QC limits.



FIGURE 11



CROSS-SECTION A-A

**TANK FARM BORINGS  
VOC CONCENTRATIONS**

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BEDFORD, OHIO

TABLE 16

TANK FARM SOIL SAMPLING  
ORGANIC ANALYSES

Sample Location	SB-8	SB-8	SB-8	SB-6	SB-7	SB-12	SB-18
Sample Number	SS-122	SS-122 Dup.	SS-122 Blank	SS-171	SS-181	SS-101	SS-116
Sample Depth (ft)	1.5-3.0	1.5-3.0	NA	1.5-3.0	1.5-3.0	3.0-4.5	3.0-4.5
Parameter (mg/kg)							
Methylene Chloride	1.1	1.0 (J)	0.026	0.980	3.6	2.2	14.0
Acetone	4.3	5.5	0.015	2.9	12.0	19.0	3.5
Trans-1,2 Dichloroethylene	LD	0.430 (J)	LD	LD	LD	1.7	LD
2-Butanone	4.7	8.8	LD	5.6	6.3	6.3	5.3
1,1,1 Trichloroethane	LD	LD	LD	LD	7.0	LD	6.0
Trichloroethylene	LD	LD	LD	LD	17.0	LD	7.7
4-Methyl-2-Pentanone	LD	LD	LD	LD	LD	LD	4.3
Tetrachloroethylene	4.5	8.0	LD	LD	LD	LD	2.1
Toluene	LD	LD	LD	LD	65.0	LD	26.0
Ethyl Benzene	LD	LD	LD	1.3	13.0	0.540	8.1
Total Xylene	LD	LD	LD	3.0	67.0	4.5	47.0
1,1,2 Trichloro-							
1,2,2 Trifluoroethane	LD	LD	0.020 (J)	LD	LD	LD	LD
Trimethylsilanol	LD	LD	0.005 (J)	LD	LD	LD	LD
1,1,2 Trimethylcyclohexane	LD	9.0	LD	LD	LD	LD	LD
2,3,4-Trimethylhexane	LD	22.0	LD	LD	LD	LD	LD
Total VOCs	14.6	54.73	0.066	13.780	190.9	34.24	124.0
OVA Reading (ppm)	100	--	--	GT 1000	GT 1000	GT 1000	GT 1000

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Dup. indicates duplicate analyses
4. Sample number SS-122 and SS-122 Dup were analyzed outside the 14 day holding time. Actual holding time was 16 days.
5. GT indicates greater than.

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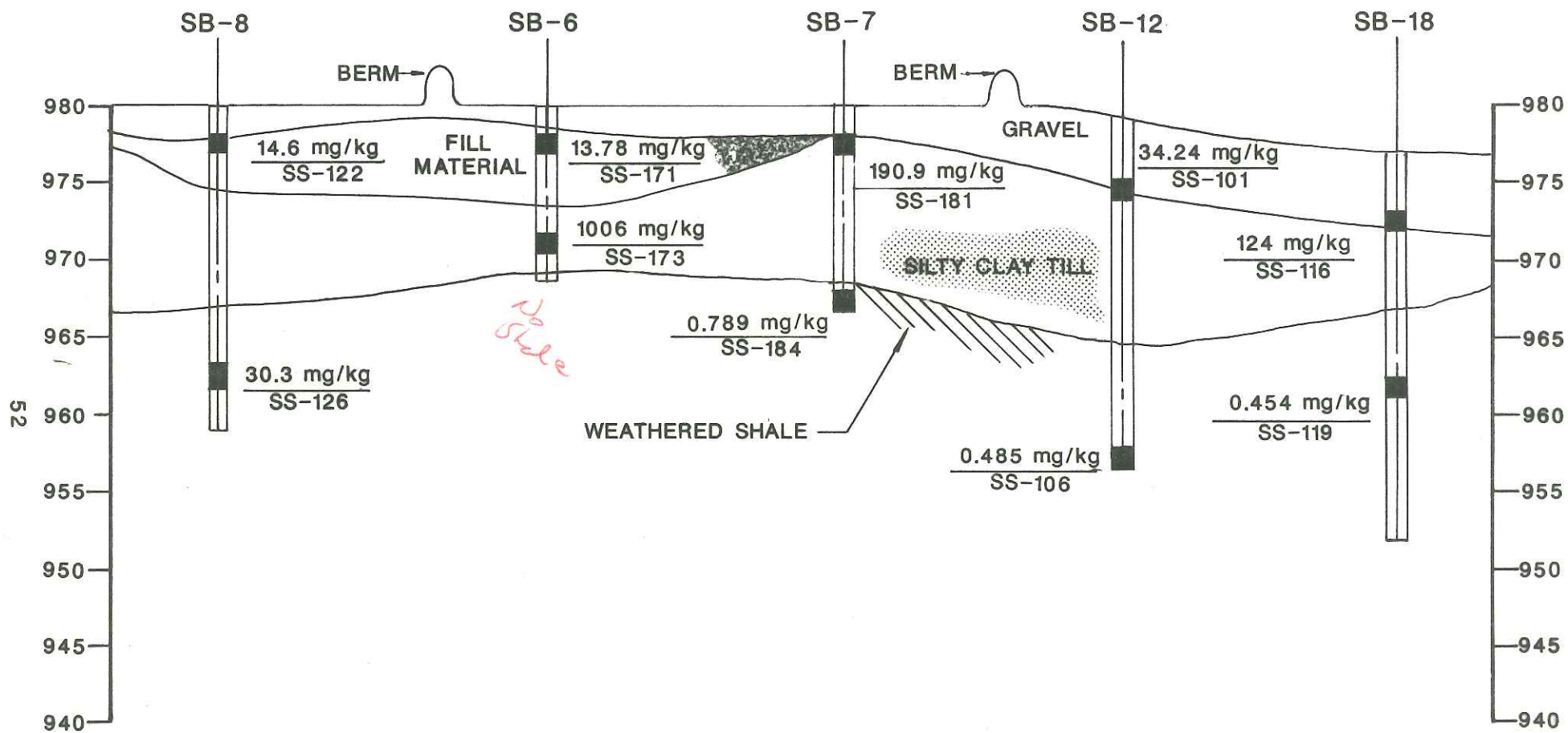
TABLE 17

TANK FARM SOIL SAMPLING  
ORGANIC ANALYSES

Sample Location	SB-8	SB-6	SB-7	SB-12	SB-18
Sample Number	SS-126	SS-173	SS-184	SS-106	SS-119
Sample Depth (ft)	16.5-17.0	7.5-9.0	12.0-13.5	23.5-24.0	16.5-17.0
Parameter (mg/kg)					
Methylene Chloride	1.4	27.0	0.270	0.078	0.160
Acetone	4.9	37.0	0.200	0.250	0.170
2-Butanone	5.0	32.0	0.036 (J)	0.023 (J)	0.019 (J)
1,1,1 Trichloroethane	LD	LD	0.090	LD	0.011 (J)
Tetrachloroethylene	19.0	LD	LD	LD	LD
Toluene	LD	340.0	0.073	0.051	0.026
Ethyl Benzene	LD	120.0	0.005 (J)	0.012 (J)	LD
Total Xylene	LD	450.0	0.025 (J)	0.071	0.028
1,1,2 Trichloro-					
1,2,2 Trifluoroethane	LD	LD	0.050 (J)	LD	0.030 (J)
Trimethylsilanol	LD	LD	0.040 (J)	LD	0.010 (J)
Total VOCs	30.3	1006.	0.789	0.485	0.454
OVA Readings (ppm)	20	GT1000	120	90	30

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Dup. indicates duplicate analyses
4. NA indicates not applicable
5. GT indicates greater than



**CROSS SECTION B-B**

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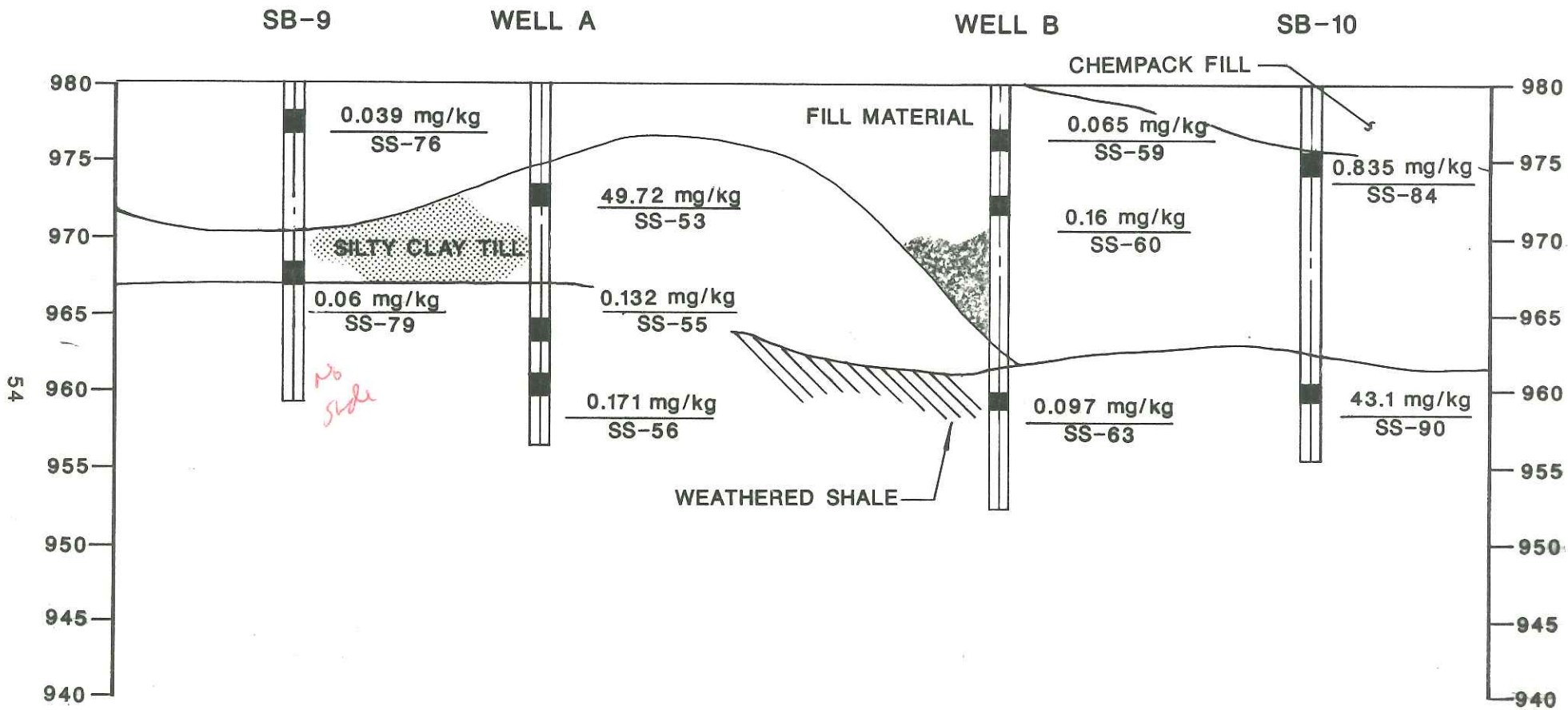
TABLE 18

SOIL SAMPLING  
OUTSIDE TANK FARM BERM  
ORGANIC ANALYSES

Sample Location	SB-9	SB-9	Well A	Well A	Well A	Well B	Well B	Well B	Well B	Well B	SB-10	SB-10
Sample Number	SS-76	SS-79	SS-53	SS-55	SS-56	SS-59	SS-59 Dup	SS-59 Blank	SS-60	SS-63	SS-84	SS-90
Sample Depth (ft)	1.5-3.0	12.0-13.5	7.5-9.0	16.5-17.0	20.0-20.5	3.0-4.5	3.0-4.5	NA	7.5-9.0	20.5-21.0	4.5-6.0	19.0-20.0
Parameter (mg/kg)												
Methylene Chloride	0.017	.021	1.9	0.005	0.011	0.007	0.010	0.023	0.007	0.011	0.058	5.1
Acetone	0.020	.035	0.820 (J)	0.030	0.026	0.033	0.043	0.076	0.110	0.070	0.570	8.5
2-Butanone	LD	.004 (J)	2.4	0.005	LD	0.005 (J)	LD	LD	0.027	0.005 (J)	0.160	3.8
1,1,1-Trichloroethane	LD	LD	LD	0.006	LD	LD	LD	LD	LD	LD	LD	LD
4-Methyl-2-Pentanone	LD	LD	LD	LD	0.005	LD	LD	LD	LD	LD	LD	LD
2-Hexanone	LD	LD	LD	0.005 (J)	LD	LD	LD	LD	LD	0.005 (J)	LD	LD
1,1 Dichloroethane	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	0.009(J)	LD
Toluene	0.002 (J)	LD	9.8	0.032	0.042	LD	LD	LD	0.004 (J)	0.001 (J)	0.038	1.1
Ethyl Benzene	LD	LD	5.8	0.007	0.013	LD	LD	LD	LD	LD	LD	3.6
Total Xylenes	LD	LD	29.0	0.032	0.055	LD	LD	LD	0.002 (J)	LD	LD	18.0
1,1,2-Trichloro-												
1,2,2-Trifluoroethane	LD	LD	LD	0.010 (J)	0.010 (J)	0.020 (J)	0.40 (J)	LD	0.010 (J)	LD	LD	LD
Trichlorofluoromethane	LD	LD	LD	LD	0.009 (J)	LD	LD	LD	LD	LD	LD	LD
Carbon Disulfide	LD	LD	LD	LD	LD	LD	LD	LD	LD	0.005 (J)	LD	LD
Propyl Benzene	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	3.0 (J)
Total VOCs	0.039	0.06	49.72	0.132	0.171	0.065	0.453	0.099	0.16	0.097	0.835	43.1
OVA Reading (ppm)	3.0	4.0	GT 1000	68	2.6	0	--	--	55	1.5	50	GT 1000

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Dup. indicates duplicate analyses.
4. NA indicates not applicable.
5. GT indicates greater than.



## CROSS SECTION C-C

and EP toxicity analyses. These results are presented in Tables 19 and 20, respectively. Low concentrations of lead were detected in each of the three samples. EP toxicity tests for lead showed less than detection levels. Each of the three soil samples also contained low levels of total arsenic close to the method detection limit. Arsenic was not detected in EP toxicity tests. Elevated levels of barium were detected in two of the samples. EP toxicity tests for barium showed low levels of barium in the leachate, 0.55 and 1.2 mg/l, respectively. Based on the low levels of total metals and EP toxic metals detected in the three samples containing the highest total VOCs, it was determined that additional samples would not be analyzed for metals.

#### 6.4 "Chem-Pack" Fill

The area graded with "Chem-Pack" material was defined by visual inspection and sampling. The approximate areal extent of the "Chem-Pack" is shown in Drawing No. 1, Appendix A. Results of inorganic analyses of a composite sample of "Chem-Pack" material and of a sample collected at approximately 3 ft. below the "Chem-Pack" fill are shown in Table 21, samples KP-3 and KP-10 respectively. Results of "Chem-Pack" samples encountered during the drilling of SB-10 (samples SSM-81 and SSM-82) and of soil (sample SSM-84) beneath the "Chem-Pack" are shown in Table 21. Table 21 shows that the "Chem-Pack" material is composed primarily of iron. Other metals in order of decreasing concentrations include manganese, zinc, copper, nickel, barium, chromium and cadmium.

A sample of soil from boring SB-21 collected beneath the "Chem-Pack" at a depth of 17.0 to 18.5 ft. showed decreased levels of these metals except that the concentration of manganese was higher than in the "Chem-Pack" fill. The concentration of arsenic was less than detected in the background soil samples.

While sampling the "Chem-Pack" fill area, two samples were visually anomalous to the "Chem-Pack" material. These samples were

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TABLE 19

TANK FARM SOIL SAMPLING  
METALS ANALYSES

Sample Location	SB-3	SB-6	SB-11
Sample Number	SSM-167	SSM-173	SSM-92
Sample Depth (ft)	12.0-13.5	7.5-9.0	0-1.5
Parameter (mg/kg)			
Arsenic	19	15	13
Barium	LD	45	202
Cadmium	LD	LD	4.8
Chromium (T)	LD	LD	LD
Lead	23	10	5.3
Mercury	LD	LD	LD
Selenium	LD	LD	LD
Silver	LD	LD	LD
% Solids	88	88	93

NOTES:

- LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.

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TABLE 20

TANK FARM SOIL SAMPLING  
EP TOXICITY ANALYSES

Sample Location	SB-3	SB-6	SB-11
Sample Number	SSM-167	SSM-173	SSM-92
Sample Depth (ft)	12.0-13.5	7.5-9.0	0-1.5
Parameter (mg/l)			
Arsenic	LD	LD	LD
Barium	LD	0.55	1.2
Cadmium	LD	LD	LD
Chromium (T)	LD	LD	LD
Lead	LD	LD	LD
Mercury	LD	LD	LD
Selenium	LD	LD	LD
Silver	LD	LD	LD

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.



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TABLE 21

"CHEM PACK" SAMPLES  
INORGANIC ANALYSES

Sample Location	See Note 1	SB-21	<i>C.P.</i> SB-10	<i>C.P.</i> SB-10	<i>Fall</i> SB-10
Sample Number	KP-3	KP-10 (2)	SSM-81	SSM-82	SSM-84
Sample Depth (ft)	See Note 1	17.0-18.5	0-1.5	1.5-3.0	4.5-6.0
Parameter (mg/kg)					
Arsenic	LD (*)	6.2 (*)	LD	LD	LD
Barium	79 (*)	87 (*)	119	54	121
Cadmium	6.3	LD	12	6.5	6.5
Calcium	--	18,400	--	--	--
Chromium (T) (R)	70	18	255	27	40
Copper (R)	152	35	--	--	--
Iron	61,100	27,200	--	--	--
Lead	72	22 (S)	110 (*)	48.9 (S)	73 (*)
Manganese (R)	453	533	--	--	--
Mercury	LD	LD	LD	LD	LD
Nickel	84	28	--	--	--
Selenium	LD	LD	LD (R)	LD (R)	LD (R)
Silver	LD	LD	LD	LD	LD
Zinc (R) (*)	289	103	--	--	--
% Solids	63	80	42	84	62

NOTES:

1. Sample number KP-3 was a composite sample of "Chem-Pack" material collected from soil borings SB-19, SB-20, SB-21, SB-25 and SB-26.
2. Sample KP-10 was a soil sample collected below the "Chem-Pack".
3. (\*) indicates duplicate analysis was not within control limits.
4. (R) indicates spike sample recovery was not within control limits.
5. (S) indicates concentration determined by method of standard addition.
6. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample refer to the laboratory results in Appendix C.
7. (--) indicates sample not analyzed.

submitted for individual metals analyses. The results of these analyses are shown in Table 22. Sample number KP-3 appeared to be foundry sand and did not contain copper as detected in "Chem-Pack". Sample KP-2 appeared to be lime and contained lower levels of the "Chem-Pack" metals except for arsenic and chromium.

The composite sample of "Chem-Pack" and the soil sample collected beneath the "Chem-Pack" were submitted for EP toxicity analysis. In addition to the standard suite of EP toxic metals, copper, iron, manganese, zinc, fluoride, sulfate, chloride, nitrate and phosphorous were also run on the leachate. Results of the EP toxicity analysis are shown in Table 23. EP toxicity analyses of the anomalous samples collected from the "Chem-Pack" fill area are shown in Table 24. Leachate contained less than EP toxic levels of metals.

#### 6.5 Northwest Fill Area

The approximate areal extent of the northwest fill area is shown on Drawing No. 1. The areal and vertical extent of the fill was determined from visual inspection and laboratory analyses of soil samples collected from borings in the area. The fill area is comprised of debris, rubble, foundry slag and sand.

Soil borings drilled in the northwest fill area were composited into two samples for laboratory analysis (Table 25). In addition to the VOCs required by the USEPA approved sampling plan, samples of the fill were analyzed for polynuclear aromatics (PAH). These chemicals have been detected in foundry materials at other sites. Table 26 contains a list of the PAH analytes.

VOC concentrations in samples from the northwest fill, shown in Table 25, are similar to the concentrations detected in the field and the laboratory blanks. Laboratory blank results are shown in Section 6.1 of this report. No PAHs were detected in the samples.

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TABLE 22

"CHEM PACK" SAMPLES  
INORGANIC ANALYSES

Sample Location	SB-25	SB-26
Sample Number	KP-1	KP-2
Sample Depth (ft)	4.5 - 6.0	1.5 - 3.0
Parameter (mg/kg)		
Arsenic (*)	LD	8.1
Barium (*)	51	73
Cadmium	3.9	LD
Calcium	14,700	--
Chromium (T) (R)	11	207
Copper (R)	LD	51
Iron	38,100	26,300
Lead	23 (S)	69
Manganese (R)	440	552
Mercury (R)	LD	LD
Nickel	LD	LD
Selenium	LD	LD
Silver	LD	LD
Zinc (R) (*)	41	144
% Solids	77	61

NOTES:

1. Samples KP-1 and KP-2 were collected in the "Chem-Pack" fill area but not composited with sample KP-3 because of anomalous appearance. These samples were analyzed individually.
2. (\*) indicates duplicate analysis was not within control limits.
3. (R) indicates spike sample recovery was not within control limits.
4. (S) indicates concentration determined by method of standard addition.
5. -- indicates parameter not analyzed.
6. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample refer to the laboratory results in Appendix C.

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TABLE 23

"CHEM-PACK"  
EP TOXICITY ANALYSES

Sample Location	See Note 1	SB-21
Sample Number	KP-3	KP-10
Sample Depth (ft)	See Note 1	17-18.5
Parameter (mg/l)		
Arsenic	LD	LD
Barium	0.270	0.540
Cadmium	LD	LD
Chromium (T)	LD	LD
Copper (2)	0.066	0.036
Iron (2)	LD	1.950
Lead	LD	0.014
Manganese (2)	1.59	10.6
Mercury	LD	LD
Nickel (2)	0.202	0.042
Selenium	LD	LD
Zinc (2)	0.108	0.126
Fluoride (2)	0.8	0.3
Sulfate (2)	1330	18
Chloride (2)	56	47
Nitrate (2)	4.7	LD
Phosphorus (2)	LD	LD

NOTES:

1. Sample number KP-3 is a composite sample of "Chem-Pack" material collected from soil borings SB-19, SB-20, SB-21, SB-25 and SB-26.
2. This parameter is not an EP Toxic chemical. Samples were digested by the USEPA's Extraction Procedure (EP) and the leachate was analyzed for this parameter.
3. LD indicates less than the detection limit. For the detection limit of a specific sample refer to the laboratory results in Appendix C.

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TABLE 24

"CHEM PACK" SAMPLES  
INORGANIC EP TOXICITY ANALYSES

Sample Location	SB - 25	SB-26
Sample Number	KP-1	KP-2
Sample Depth (ft)	4.5 - 6.0	1.5 - 3.0
Parameter (mg/l)		
Arsenic	LD	LD
Barium	0.210	0.25
Cadmium	LD	LD
Chromium	LD	3.86
Copper (2)	0.018	0.060
Iron (2)	7.2	0.17
Lead	LD	LD
Manganese (2)	3.95	0.898
Mercury	LD	LD
Nickel (2)	0.047	LD
Selenium	LD	LD
Zinc (2)	0.081	0.075
Flouride (2)	0.2	0.5
Sulfate (2)	57	900
Chloride (2)	2	14
Nitrate (2)	LD	7
Phosphorous (2)	LD	LD

NOTES:

1. Samples KP-1 and KP-2 were collected in the "Chem Pack" fill area but not composited with sample KP-3 because of anomalous appearance. These samples were analyzed individually.
2. This parameter is not EP Toxic. Samples were digested by the USEPA's Extraction Procedure (EP) and the leachate was analyzed for this parameter.
3. LD indicates less than the detection limit. For the detection limit of a specific sample refer to the laboratory results in Appendix C.

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TABLE 25

NORTHWEST FILL AREAORGANIC ANALYSESCOMPOSITE SAMPLES

Sample Location	See Note 1	See Note 1	See Note 1	See Note 2
Sample Number	SS-120	SS-120	SS-120	SS-119
Sample Depth	See Note 1	Duplicate	Blank	See Note 2
Parameter (ug/kg)				
Methylene Chloride	10	9	31	7
Acetone	8 (J)	7 (J)	6 (J)	10
Toluene	3 (J)	3 (J)	1 (J)	2 (J)
Trimethylsilanol	LD	LD	3 (J)	LD
Polynuclear Aromatics (PAH)	LD	LD	LD	LD

NOTES:

1. Sample number SS-120 is a composite sample of the fill collected from soil borings SB-28, SB-29 and SB-30.
2. Sample number SS-119 is a composite sample of the fill collected from soil borings SB-31, SB-32 and SB-33.
3. LD indicates less than the deletion limit. For the detection limit of a specific sample refer to the laboratory results in Appendix C.
4. (J) indicates compound identified at a concentration estimated below the detection limit.

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TABLE 26

POLYNUCLEAR AROMATIC ANALYTES

Acenaphthene  
Acenaphthylene  
Anthracene  
Benzo(a)Anthracene  
Benzo(a)Pyrene  
3,4-Benzofluoranthene  
Benzo(ghi)Perylene  
Benzo(k)Fluoranthene  
Chrysene  
Dibenzo(a,h)Anthracene  
Fluoranthene  
Fluorene  
Indeno(1,2,3cd) Pyrene  
Naphthalene  
Phenanthrene  
Pyrene  
2-Methylnaphthalene

Four samples collected from the northwest fill area were submitted for individual analyses. The decision to submit these samples for individual analyses was based on either anomalous appearance or OVA readings above background. The results of the individual analyses are summarized in Table 27. VOC concentrations were at or near the concentrations of VOCs detected in the method and field blanks. PAHs were not detected. OVA readings are presented in Table 27. The OVA readings above background may be due to the presence of natural organic materials.

The composite samples collected of the northwest fill were submitted for total metals analyses and the results are shown in Table 28. Concentrations of arsenic, barium, cadmium and chromium were at or near background levels. The samples contained iron, copper, lead, manganese and nickel, and no selenium or silver was detected. A low level of mercury (0.34 mg/kg) was detected in the sample composited from soil borings SB-31, SB-32 and SB-33.

EP toxicity analyses were performed on samples of the fill. In addition to the eight EP toxic metals, the leachate was analyzed for additional parameters (Table 29). Less than EP toxic levels of metals and low concentrations of sulfates were detected in the leachate.

## 6.6 Underground Cistern

Pursuant to EA's engineering report, "Closure Plan for Underground Cistern", liquid and sediment were removed from the cistern and disposed of as a hazardous waste. Soil samples were collected from soil borings drilled around the cistern. The interior of the tank was inspected by the HCC plant manager and the results of the inspection are included in this section.

### 6.6.1 Cistern Description and General Conditions

The underground cistern is located east of the HCC processing building. The cistern is a 5 ft. high oval shaped concrete tank,



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TABLE 27

NORTHWEST FILL AREA  
ORGANIC ANALYSES

Sample Location	SB-29	SB-29	SB-29	SB-30	SB-31	SB-31
Sample Number	SS-84	SS-84RA	SS-85	SS-112	SS-113	SS-113RA
Sample Depth (ft)	2.0-3.5	2.0-3.5	3.5-5.0	8.0-9.5	22.5-23.5	22.5-23.5
Parameter (ug/kg)						
Methylene Chloride	LD	LD	18	LD	8	9
Acetone	13	11	34	76	24	27
Toluene	5	3(J)	21	1(J)	2(J)	2(J)
Trimethylsilanol (2)	10	10(J)	LD	10(J)	LD	LD
2-Butanone	LD	5 (J)	LD	7 (J)	LD	LD
Polynuclear Aromatics	LD	--	--	LD	LD	--
OVA Reading (ppm)	55	--	2.0	340	600	--

NOTES:

1. RA indicates reanalysis by laboratory.
2. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific compound refer to the laboratory results in Appendix C.
3. (J) indicates compound identified at a concentration below the detection limit.
4. Surrogate recoveries for sample SS-84 and SS-113 were outside QC limits due to matrix interference. Sample was reanalyzed (SS-84A and SS-113RA) and surrogates were also outside QC limits due to matrix interference.
5. -- indicates parameter not analyzed.

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TABLE 28

NORTHWEST FILL AREA  
METALS ANALYSES  
COMPOSITE SAMPLES

Sample Location	See Note 1	See Note 1	See Note 1	See Note 2
Sample Number	SS-120 Comp.	SS-120 Comp.	SS-120 Comp.	SS-119 Comp.
Sample Depth (ft)	See Note 1	Duplicate	Blank	See Note 2
Parameter (mg/kg)				
Arsenic (*)	21	23	LD	15
Barium (*)	172	95	LD	61
Cadmium	3.9	3.3	LD (*)	LD
Chromium (R)	26	22	LD	LD
Copper (R)	78	90	LD	136
Iron	61,200	52,100	LD	52,600
Lead	273	184	LD	167
Manganese (R)	501	430	LD	537
Mercury (R)	LD	LD	LD	0.34
Nickel	22	20	LD	21
Selenium	LD	LD	LD	LD
Silver	LD	LD	LD	LD
Zinc (R) (*)	1,230	872	LD	251
% Solids	89	89	100	89

NOTES:

1. Sample number SS-120 comp. is a composite sample of the fill collected from soil borings SB-28, SB-29 and SB-30.
2. Sample number SS-119 is a composite sample of the fill collected from soil borings SB-31, SB-32 and SB-33.
3. (\*) indicates duplicate analysis was not within control limits.
4. (R) indicates spike sample recovery was not within control limits.
5. LD indicates less than the detection limit. For the detection limit of a specific compound refer to the laboratory results in Appendix C.

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TABLE 29

NORTHWEST FILL AREA  
EP TOXICITY ANALYSES

	<u>Composite Samples</u>			
	See Note 1	See Note 1	See Note 1	See Note 2
Sample Location	See Note 1	See Note 1	See Note 1	See Note 2
Sample Number	SS-120 Comp.	SS-120 Comp.	SS-120 Comp.	SS-119 Comp.
Sample Depth	See Note 1	Duplicate	Blank	See Note 2
Parameter (mg/l)				
Arsenic	LD	LD	LD	LD
Barium	0.130	0.150	LD	0.210
Cadmium	LD	LD	LD	LD
Chromium	LD	LD	LD	LD
Copper (3)	0.038	0.030	0.056	0.019
Iron (3)	0.380	0.350	LD	13.9
Lead	0.026	0.024	0.010	0.050
Manganese (3)	2.280	2.940	LD	3.94
Mercury	LD	LD	LD	LD
Nickel (3)	0.092	0.130	LD	0.081
Selenium	LD	LD	LD	LD
Zinc (3)	1.070	2.280	0.129	3.7
Fluoride (3)	1.0	1.1	LD	0.1
Sulfate (3)	38.0	41.	15	23.0
Chloride (3)	2.0	LD	LD	LD
Nitrate (3)	LD	LD	0.3	0.1
Phosphorus (3)	LD	LD	LD	LD

NOTES:

1. Sample number SS-120 comp. is a composite sample of the fill collected from soil borings SB-28, SB-29 and SB-30.
2. Sample number SS-119 is a composite sample of the fill collected from soil borings SB-31, SB-32 and SB-33.
3. This parameter is not an EP Toxic chemical. Samples were digested by the USEPA's Extraction Procedure (EP) and the leachate was analyzed for this parameter.
4. LD indicates less than the deletion limit. For specific sample detection limits refer to the laboratory results in Appendix C.

approximately 9 ft. in length by approximately 6 ft. wide with a 2 piece concrete slab cover. A cross section of the cistern is shown in Figure 14. The tank has one interior baffle and one 4 in. diameter inlet pipe. The depth from grade and to the concrete cover of the cistern is approximately eight ft. The distance from grade to the bottom of the cistern is approximately 13 ft.

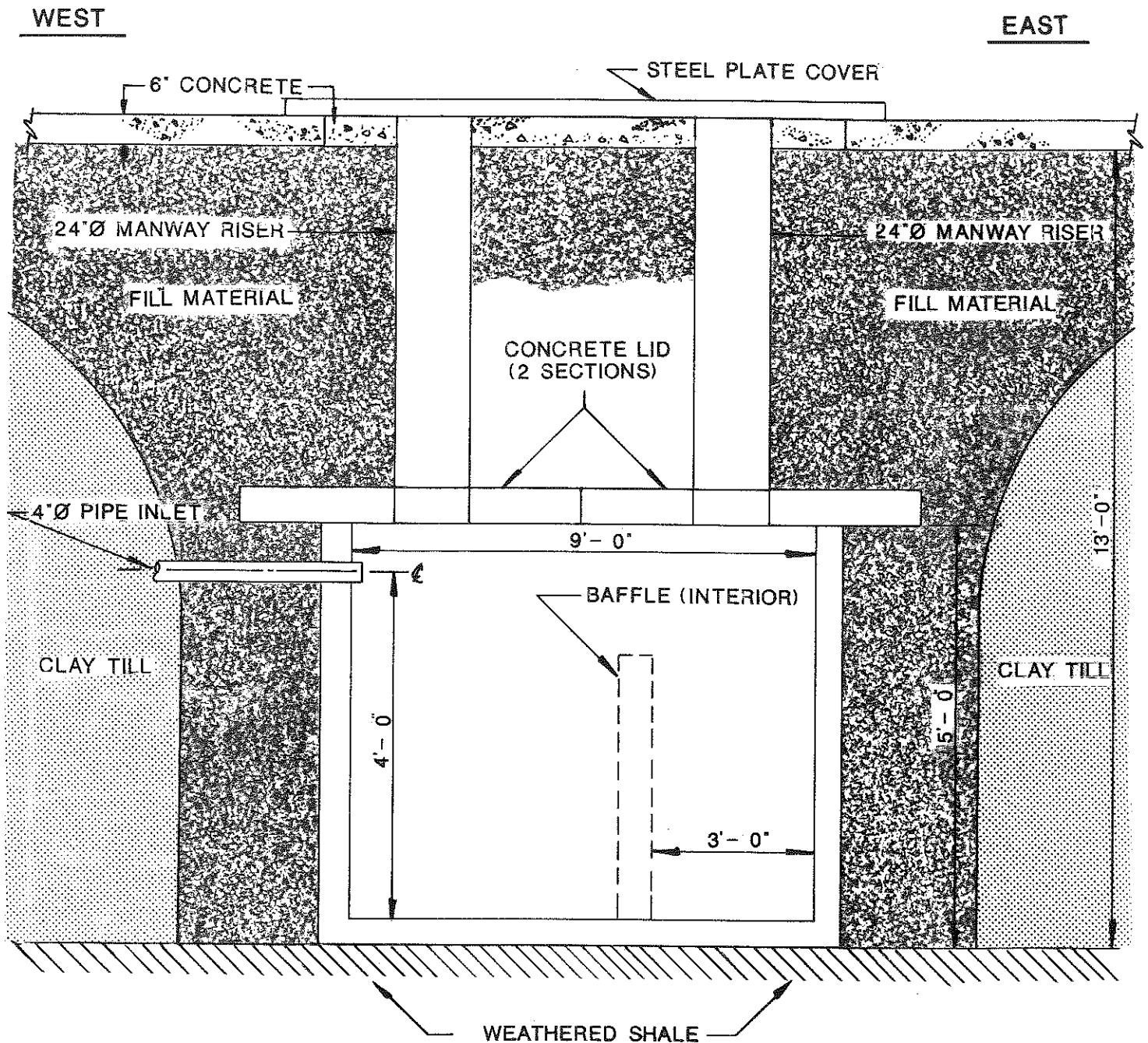
There are two, approximately 24 in., riser manways extending from the top of the cistern to grade where they are covered by a steel plate. The inlet pipe to the cistern is located approximately 4 ft. from the bottom of the tank.

The concrete structure of the tank has deteriorated and reinforcing wire is exposed in certain sections. There is evidence of synthetic caulking and/or grout applied at the lid to tank wall joints. Prior to pumping, there was approximately 13 inches of sediment in the west compartment. During the inspection, there was liquid flowing through the inlet pipe at a rate of approximately 5 gallons per hour. A layer of hydrocarbons was observed floating on the liquid entering the cistern and on the liquid in the cistern prior to pumping. The hydrocarbon was sampled and submitted to the laboratory for analysis.

Infiltration through the walls of the cistern and the manway risers was observed during the inspection. Prior to the inspection, the tank was twice pumped empty.

The cistern was once used as secondary containment for spills occurring in the HCC processing building and floor drains and trenches located in the processing building were connected to the cistern. Liquid drained by gravity from floor drains to the cistern. Drawing No. 2 shows the approximate locations of the drains in the processing building as well as the interconnecting piping to the cistern.

The floor drains were sealed in 1982 and additional concrete was placed in each floor/trench drain in September 1986 under EA direction.



NOTE

1. DIMENSIONS SHOWN ARE APPROXIMATE.

UNDERGROUND CISTERN  
CROSS SECTION

N.T.S

*Groundwater Seepage*

Prior to sampling, the level of liquid in the cistern was approximately 1 ft. below grade, as measured in the riser manways. In April 1986, the tank was emptied but it refilled to approximately 1 ft. below grade. In September 1986, the liquid was again removed from the cistern and HCC retained an industrial waste contractor to vacuum the sediment from the cistern. At this time, the inlet pipe to the cistern was plugged in accord with EA's May 20, 1986 letter to OEPA.

#### 6.6.2 Cistern Liquid and Sediment Sampling

Samples of liquid and sediment in the cistern were collected and analyzed in accordance with the protocol described in EA's engineering report, "Closure Plan for Underground Cistern".

The results of organic analyses of samples collected of the liquid in the cistern (CS-1) and entering the cistern through the inlet pipe (CS-6) are shown in Table 30. VOCs and a floating layer of mineral spirits were detected in both samples.

Results of metals analyses conducted on liquid collected from the cistern are shown in Table 31. Low levels of barium, chromium and mercury were detected in the liquid.

Analyses of residue collected from the cistern are shown in Tables 32 and 33. Both VOCs and heavy metals were detected in the residue. An EP toxicity analysis of the residue was performed and the results are shown in Table 34. Based on these results, the residue is not EP toxic.

#### 6.6.3 Soil Sampling

In April/May 1986, six borings, SBC-1, SBC-2, SBC-3, SBC-4, SBC-5 and SBC-6 were drilled in the area of the cistern to determine the extent of soil contamination (Drawing No. 1). The cistern closure plan required that a boring be drilled through the bottom of the tank, however, due to the occurrence of standing water in the tank, it was determined that this boring should not be drilled.



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TABLE 30

SAMPLING RESULTS  
ORGANIC ANALYSES

Sample Location Sample Number	Cistern CS-1	Cistern Inlet Pipe CS-6
Parameter (mg/l)		
Acetone	980.0	510.0
2-Butanone	360.0	440.0
Methylene Chloride	1300.0	300.0
Toluene	39.0 (J)	110.00
Xylene	LD	77.0
Butyl Acetate	LD	60.0
Ethyl Benzene	LD	16.0
4-Methyl, 2-Pentanone	LD	1100.0
Hexanone	LD	79.0
Mineral Spirits	SEE NOTE 3	
TOC	2760.0	--
TOX	23.0	--

NOTES:

1. LD indicates less than the detection limit.
2. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
3. Laboratory analysis identified floating oil layer on samples CS-1 and CS-6 as mineral spirits.
4. -- indicates parameter was not analyzed.

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TABLE 31

CISTERN LIQUID  
METALS ANALYSES

Sample Number	<u>CS-1</u>
Parameter (mg/l)	
Arsenic	LD
Barium	0.120
Cadmium	LD
Chromium	0.048
Lead	LD
Mercury	0.6
Selenium	LD
Silver	LD

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.



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TABLE 32

CISTERN RESIDUE  
ORGANIC ANALYSES

Sample Number	CSS-1
Parameter (mg/kg)	
Acetone	9,300.0
Methyl Ethyl Ketone	8,000.0
1,1,1-Trichloroethane	34,000.0
Methylene Chloride	140,000.0
Trichloroethylene	8,100.0 (J)
Toluene	21,000.0
Xylene	22,000.0
Ethyl Benzene	4,500.0

NOTES:

1. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific compound refer to the laboratory reports in Appendix C.
2. J indicates compound identified at a concentration estimated below the detection limit.

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TABLE 33

CISTERN RESIDUE  
METALS ANALYSES

Sample Number	CSS-1
Parameter (mg/kg)	
Arsenic	17
Barium	4630
Cadmium	92
Chromium	3390
Lead	7130
Mercury	3.5
Selenium	LD
Silver	LD
% Solids	35

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the specific sample detection limit.

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TABLE 34

CISTERN RESIDUE  
EP TOXICITY ANALYSES

Sample Number	<u>CSS-1</u>
Parameter (mg/l)	
Arsenic	LD
Barium	0.490
Cadmium	0.300
Chromium	0.200
Lead	LD
Mercury	LD
Selenium	LD (R)
Silver	0.010

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the specific sample detection limit.
2. (R) indicates spike sample recovery was not within control limits.

Inspection of the cistern and the occurrence of liquid through the inlet pipe and infiltration through the cistern walls, lid and extension manways, indicates that perched water infiltrates the interconnecting piping to the cistern and that perched water is found in the fill around the cistern. In EA's August 1986 engineering report, additional borings were proposed around the interconnecting piping to the cistern in and around the processing building at the HCC facility. These borings are identified as SB-36, SB-36A, SB-37, SB-34, SB-35 and SB-38 and are shown in Drawing No. 1. Soil and/or perched water samples were collected during the drilling of these borings.

In accordance with the closure plan, soil samples were collected in borings at three elevations around the cistern as follows:

0.5 to 2.0 ft.

8.0 to 9.5 ft.

13.0 to 14.5 ft.

These elevations correspond to: 1) the soil just beneath the concrete pad in the area of the cistern; 2) the lid of the cistern; and 3) the bottom of the cistern. Per the Closure Plan, four soil borings were to be drilled around the cistern. Two additional borings SBC-5 and SBC-6 (Drawing No. 1) were drilled further away from the cistern to determine the vertical and areal extent of soil contamination.

The organic analyses of samples from the cistern borings are shown in Tables 35-37. Figure 15 shows the total VOC concentrations in a vertical cross section of the cistern borings. All borings except SBC-4 are shown. Concentrations of VOCs ranged from 6700 mg/kg at grade near the cistern to 0.945 mg/kg at 12.0 to 13.5 ft. in boring SBC-6, approximately 30 ft. east of the cistern. Figure 15 shows that the VOC concentrations decrease with depth below grade and distance from the cistern. VOC concentrations in soil boring SBC-6 approach background levels (0.945 mg/kg) at 12.0 to 13.5 ft. below grade.

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TABLE 35

CISTERN BORINGS  
ORGANIC ANALYSES

*mostly blank*

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4	SBC-5	SBC-6
Sample Number	SS-128	SS-133	SS-137	SS-144	SS-148	SS-152
Sample Depth (ft)	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0
Parameter (mg/kg)						
Methylene Chloride	1.6	730	78 (J)	63	41	6.8
Acetone	23	LD	LD	240	160	LD
2-Butanone	10	LD	LD	320	130	9 (J)
1,1,1 Trichloroethane	2.4	LD	160	LD	LD	LD
4-Methyl-2 Pentanone	4.3	LD	LD	LD	19	LD
Tetrachloroethylene	15	LD	280	330	LD	9.9
Toluene	14	2600	1600	91	7.2	47
Chlorobenzene	18	LD	LD	LD	LD	LD
Ethyl Benzene	4.2	670	510	24 (J)	1.3 (J)	20
Xylene	19	2700	2000	130	6.6	120
Total VOCs	111.5	6700	4628	1198	365.1	212.7
OVA Readings (ppm)	GT 1000	GT 1000	GT 1000	GT 1000	GT 1000	GT 1000

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. GT indicates greater than.

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TABLE 36

CISTERN BORINGS  
ORGANIC ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4	SBC-5	SBC-6
Sample Number	SS-131	SS-135	SS-139	SS-146	SS-150	SS-154
Sample Depth (ft)	8.0-9.5	8.0-9.5	8.0-9.5	8.0-9.5	6.5-8.0	8.0-9.0
Parameter (mg/kg)						
Methylene Chloride	380	0.7	84	1.7	--	--
Acetone	1000	5.3	45	6.9	--	--
2-Butanone	1500	5.8	76	9.3	--	--
1,1,1 Trichloroethane	LD	LD	5	LD	--	--
4-Methyl-2 Pentanone	LD	LD	27	LD	--	--
Tetrachloroethylene	LD	LD	4.2	LD	--	--
Toluene	680	LD	41	1.5	--	--
Chlorobenzene	LD	LD	LD	LD	--	--
Ethyl Benzene	200 (J)	LD	13	0.29 (J)	--	--
Xylene	940	LD	47	1 (J)	--	--
Total VOCs	4700	11.8	342.2	20.69	--	--
OVA Readings (ppm)	GT 1000	900	--	850	320	400

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. -- indicates sample collected, but not submitted for laboratory analyses.
4. Sample number SS-135 was analyzed outside the 14 day holding time. Actual holding time was 16 days.

GT indicates greater than

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TABLE 37

CISTERN BORINGS  
ORGANIC ANALYSES

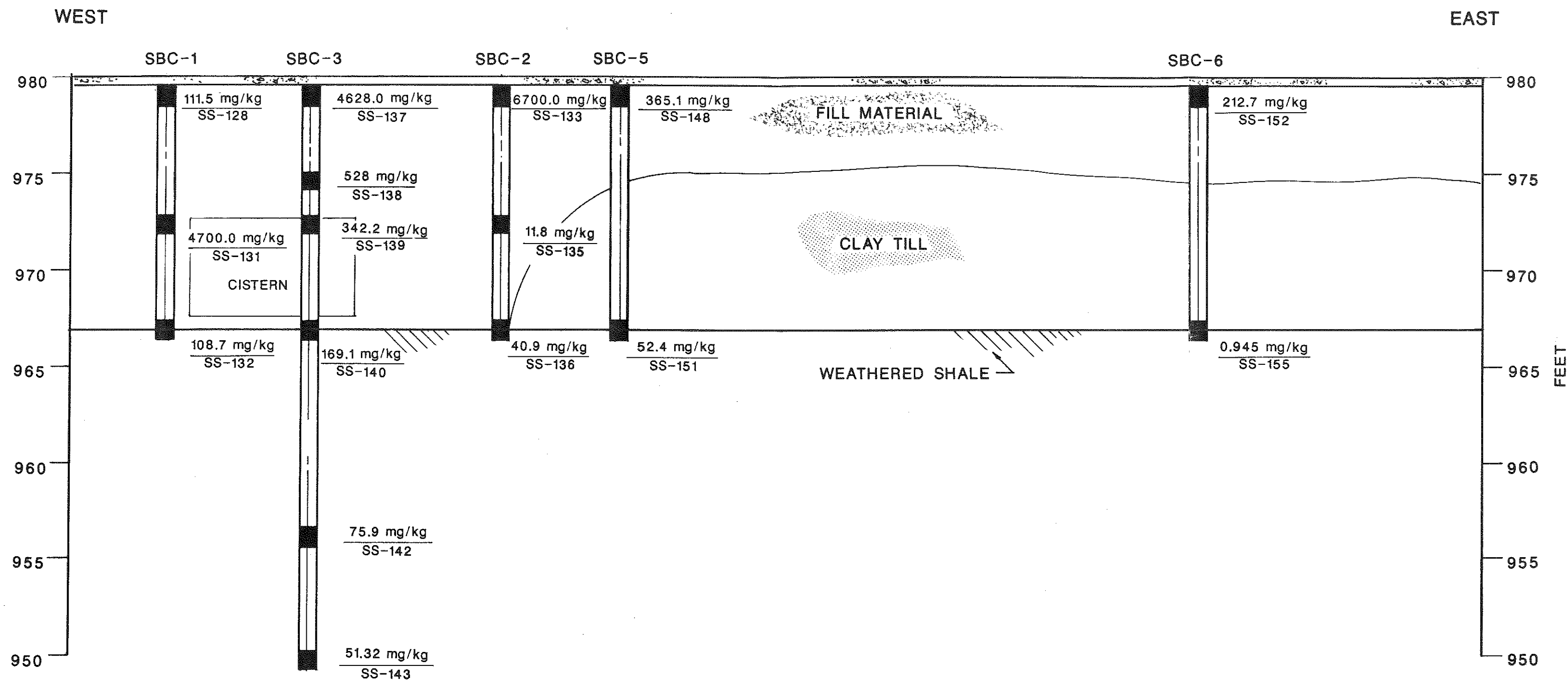
Sample Location	SBC-1	SBC-2	SBC-3	SBC-4	SBC-5	SBC-6	SBC-6
Sample Number	SS-132	SS-136	SS-140	SS-147	SS-151	SS-155	SS-155 RA
Sample Depth (ft)	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5
Parameter (mg/kg)							
Methylene Chloride	6.8	1.7	8.5	1.8	4.3	0.21	0.21
Acetone	16	7.8	32	3.2	12	0.14	0.11
2-Butanone	16	6.6	49	5.4	15	0.006(J)	LD
1,1,1 Trichloroethane	LD	LD	LD	LD	LD	0.043	0.037
4-Methyl-2 Pentanone	7.9	LD	11	3.2	2.8	LD	LD
Tetrachloroethylene	LD	LD	4.8	0.88	LD	0.041	0.042
Toluene	29	9.1	24	11.0	7.5	0.180	0.160
Chlorobenzene	LD	LD	LD	LD	LD	LD	LD
Ethyl Benzene	6	2.7	7.8	5.2	2.1	0.037	0.035
Xylene	27	13	32	23	8.7	0.180	0.190
Trans-1,2 Dichloroethylene	LD	LD	LD	LD	LD	0.008	LD
Trichloroethylene	LD	LD	LD	LD	LD	0.010	0.010 (J)
1,1,2-Trichloro -1,2,2-Trifluoroethane	LD	LD	LD	LD	LD	0.090 (J)	0.060 (J)
Trimethylsilanol	LD	LD	LD	LD	LD	LD	0.030 (J)
Total VOCs	108.7	40.9	169.1	53.68	52.4	0.945	0.884
OVA Readings (ppm)	GT 1000	GT 1000	--	GT 1000	340	140	--

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Sample number SS-136 was analyzed outside the 14 day holding time. Actual holding time was 16 days.
4. The surrogate recoveries for sample number SS-155 were outside the QC limits due to matrix effects. Refer to the "Soil Surrogate Percent Recovery Summary" in Appendix C. Sample was reanalyzed SS-155RA.



FIGURE 15



**CISTERN BORINGS**  
**VOC CONCENTRATIONS**

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Based on the elevated OVA readings obtained in the field, it was decided to drill one of the cistern soil borings to groundwater and collect soil samples. Table 38 shows the analyses of samples collected below 13.5 ft. in soil boring SBC-3. VOCs (51.32 mg/kg) were detected in the samples collected to a depth of 27.0 to 27.5 ft. Groundwater was encountered at 26 ft.

Perched water was encountered at depths of 13 ft. and 12 ft. while drilling SBC-3 and SBC-6.

The results of total metal analyses and EP toxicity analyses conducted on soil samples collected from SBC-1, SBC-2, SBC-3 and SBC-4 are shown in Tables 39-44. In accord with OEPA September 17, 1985 policy guidance, "Clean Levels for Closures", the soil samples were evaluated with the Student's t-test to determine whether metals contamination was found around the cistern. At the 0.01 level of significance, none of the soil samples collected around the cistern could confidently be said to contain metal concentrations significantly greater than background. No soil samples exhibited EP toxicity.

Six soil borings (SB-34, SB-35, SB-36, SB-36A, SB-37 and SB-38) were drilled in and around the HCC process building to define the extent of perched water believed to be migrating to the cistern and associated piping. The soil borings are shown on Drawing No. 1. Perched water was encountered in SB-36, SB-36A, SB-37 and SB-38 between 2.0 to 3.0 ft. Samples of the perched water were collected and submitted for VOC analysis and the results are shown in Table 45. Perched water did not accumulate in boring SB-38 and it could not be sampled. Perched water was not encountered during the drilling of soil borings SB-34 and SB-35. Table 45 shows that VOCs similar to those found in the cistern were detected in the perched water. VOC concentrations were lower in the sample collected in SB-37, the boring furthest from the cistern. No mineral spirits were identified in the perched water samples.

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TABLE 38

CISTERN BORINGS  
ADDITIONAL SAMPLING DEPTHS  
ORGANIC ANALYSIS

Sample Location	SBC-3	SBC-3	SBC-3
Sample Number	SS-138	SS-142	SS-143
Sample Depth	5.0-6.5	21.5-22.0	27.0-27.5
Parameter (mg/kg)			
Methylene Chloride	19 (J)	6.1	2.7
Acetone	100	38	16.
2-Butanone (MEK)	46 (J)	22	22
4-Methyl-2-Pentanone (MIBK)	LD	LD	4.2
Toluene	120	3.4	2.3
Ethyl Benzene	43	1.0 (J)	0.82 (J)
Xylene	200	5.4	3.3
Total VOCs	528	75.9	51.32
OVA Reading (ppm)	GT 1000	100	GT 1000

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.

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TABLE 39

CISTERN SOIL SAMPLING  
METALS ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SS-128	SS-133	SS-137	SS-144
Sample Depth (ft)	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0
Parameter (mg/kg)				
Arsenic	13	16	16	15
Barium	LD	LD	LD	LD
Cadmium	LD	LD	LD	LD
Chromium	LD	LD	LD	LD
Lead	5.3	7.8	10	15 (S)
Mercury	LD	LD	LD	LD
Selenium	LD	LD	LD	LD
Silver	LD	LD	LD	LD

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (S) indicates concentration determined by the method of standard addition.

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TABLE 40

CISTERN SOIL SAMPLING  
METALS ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-131	SSM-135	SSM-139	SSM-146
Sample Depth (ft)	8.0-9.5	8.0-9.5	8.0-9.5	8.0-9.5
Parameter (mg/kg)				
Arsenic	17	22	23	21
Barium	96	LD	76	LD
Cadmium	LD	LD	LD	4.1
Chromium	23	12	LD	18
Lead	70	12	21 (S)	15 (S)
Mercury	LD	LD	LD	LD
Selenium	LD	LD	LD	LD
Silver	LD	LD	LD	LD

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. Refer to Appendix C for the specific sample detection limit.
2. (S) indicates concentration determined by the method of standard addition.

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TABLE 41

CISTERN SOIL SAMPLING  
METALS ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-132	SSM-136	SSM-140	SSM-147
Sample Depth (ft)	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5
Parameter (mg/kg)				
Arsenic	18	29	19	17
Barium	LD	LD	LD	LD
Cadmium	LD	4.1	5.3	LD
Chromium	16	15	11	12
Lead	9.9 (S)	19 (S)	9 (S)	LD
Mercury	LD	LD	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	LD	LD	LD	LD

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the specific sample detection limit.
2. (S) indicates concentration determined by the method of standard addition.

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TABLE 42

CISTERN SOIL SAMPLING  
EP TOXICITY ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-128	SSM-133	SSM-137	SSM-144
Sample Depth (ft)	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0
Parameter (mg/l)				
Arsenic	LD	LD	LD	LD
Barium	0.24	0.15	0.16	0.23
Cadmium	LD	LD	0.017	LD
Chromium (T)	LD	LD	LD	LD
Lead	LD	LD	LD	LD
Mercury	LD	LD	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	0.01	0.01	0.01	0.01

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (R) indicates spike sample recovery was not within control limits.

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TABLE 43

CISTERN SOIL SAMPLING  
EP TOXICITY ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-131	SSM-135	SSM-139	SSM-146
Sample Depth (ft)	8.0-9.5	8.0-9.5	8.0-9.5	8.0-9.5
Parameter (mg/l)				
Arsenic	LD	LD	LD	LD
Barium	0.6	LD	0.26	LD
Cadmium	0.011	LD	LD	LD
Chromium (T)	LD	LD	LD	LD
Lead	0.043	LD	LD	LD
Mercury	0.002	0.002	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	0.01	0.01	0.01	0.01

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (R) indicates spike sample recovery was not within control limits.

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TABLE 44

CISTERN SOIL SAMPLINGEP TOXICITY ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-132	SSM-136	SSM-140	SSM-147
Sample Depth (ft)	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5
Parameter (mg/l)				
Arsenic	LD	LD	LD	LD
Barium	LD	LD	0.07	LD
Cadmium	LD	LD	LD	LD
Chromium (T)	LD	LD	LD	LD
Lead	LD	LD	LD	LD
Mercury	0.005	LD	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	0.01	0.01	0.01	0.01

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (R) indicates spike sample recovery was not within control limits.



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TABLE 45

CISTERN BORINGS  
PERCHED WATER ORGANIC ANALYSES

*Process Bldg*

Sample Location	SB-36	SB-36A	SB-37
Sample Number	SS-24	SS-27	SS-19
Sample Date	9/18/86	9/18/86	9/18/86
Parameter (mg/l)			
Acetone	220.0	230.0	LD
Methylene Chloride	380.0	460.0	LD
2-Butanone	430.0	420.0	LD
Toluene	24.0	25.0	160.0
Isopropyl Alcohol	LD	30.0 (J)	LD
4-Methyl, 2-Pentanone	36.0 (J)	31.0 (J)	LD
Hexanone	360.0	240.0	LD
Tetrahydrofuran	70.0 (J) <sup>(3)</sup>	LD	LD
TOC	42,000.	38,500	49.9
TOX	49.	68	0.300

NOTES:

1. LD indicates less than the detection limit.
2. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
3. Result includes the concentration of propyl furan.
4. -- indicates parameter was not analyzed.
5. J indicates compound identified at a concentration below the detection limit.

Soil samples were also collected during the drilling of soil borings SB-34, SB-35, SB-37 and SB-38. The results of these samples are shown in Table 46. With the exception of a soil sample collected in soil boring SB-38 between 3.5 to 5.0 ft., the samples contained low levels of VOCs. The SB-38 sample collected between 3.5 to 5.0 ft. contained 146 mg/kg total VOCs. However, the deeper sample (12.5 to 13.5 ft.) from this boring contained 1.8 mg/kg total VOCs.

#### 6.7 Neutralization Pits

In April 1986, isopropyl ether was detected in background soil boring SB-14. The boring was relocated and redrilled as discussed in Section 5.0. The occurrence of isopropyl ether was investigated and conversations with plant personnel indicated that isopropyl ether was an acid base compound containing sulfuric acid and phosphoric acid at concentrations of 25% and 15%, respectively. It was also determined that there was a single instance discharge of off-spec isopropyl ether product to the neutralization pits for treatment. Isopropyl ether is not a regulated substance and is not on the Hazardous Substance List (HSL). To verify that there were no other organic chemicals discharged to the neutralization pits, soil samples collected from the pits were analyzed for organic chemicals.

The results of the organic analyses of samples from the neutralization pits are shown in Tables 47 and 48. Concentrations of VOCs, except isopropyl ether, were similar to concentrations detected in background soil sample. Isopropyl ether was detected at 1175 ug/kg at 9.5 to 11.0 ft. in the east neutralization pit and at 60 ug/kg in the west neutralization pit at similar depth.

Samples from soil borings SB-14, SB-43, PH-1 and PH-2-3 were sent to the laboratory for organics analysis to define the extent of the isopropyl ether in the ground and to verify that other organics were not present. The locations of these borings are shown in Drawing No. 1, the laboratory data is shown in Table 49. Other than isopropyl

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TABLE 46

CISTERN BORINGS

Sample Location	SB-34	SB-35	SB-37	SB-38	SB-38
Sample Number	SS-17	SS-6	SS-22	SS-11	SS-13
Sample Depth (ft)	3.5-5.0	17.5-18.0	12-13.5	3.5-5.0	12.5-13.5
Parameter (mg/kg)					
Methylene Chloride	0.012	0.510	0.074	11 (J)	0.130
Acetone	0.210	0.130	0.230	LD	0.570
2-Butanone	0.013 (J)	0.041 (J)	0.016 (J)	LD	0.170
1,1,1 Trichloroethane	LD	0.110	LD	LD	0.015
Trichloroethylene	LD	0.110	LD	LD	LD
Benzene	LD	LD	LD	LD	0.013 (J)
4-Methyl-2 Pentanone	LD	0.026 (J)	LD	LD	0.069
Tetrachloroethylene	LD	0.600	LD	LD	0.026
Toluene	LD	0.100	LD	37	0.250
Ethyl Benzene	LD	0.043	LD	16 (J)	0.029
Total Xylenes	LD	0.250	LD	82	0.110
1,1,2-Trichloro					
1,2,2-Trifluoroethane	LD	LD	0.7 (J)	LD	0.400 (J)
Propane, 2-2' Oxybis	LD	LD	LD	LD	0.020 (J)
Total VOCs	0.235	1.92	1.02	146	1.802
OVA Reading (ppm)	100	100	3.5	GT 1000	12

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.

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TABLE 47

WEST NEUTRALIZATION PIT  
ORGANIC ANALYSES

Sample Location	SB-39 and SB-40 (1)	
Sample Number	SS-122	SS-123
Sample Depth (ft)	4.5-6.0	9.5-11.0
Parameter (ug/kg)		
Methylene Chloride	89	68
Acetone	44	78
Toluene	1 (J)	LD
1,1,2 Trichloro- 1,2,2 Trifluoroethane	100 (J)	20 (J)
Chloroform	LD	21
Propane, 2,2'-Oxybis (isopropyl ether) (3)	LD	60 (J)
Trimethylsilanol (3)	LD	6 (J)
Total VOCs	234	253
OVA Readings	--	--

NOTES:

1. Sample numbers SS-122 and SS-123 were composite samples of soil borings SB-39 and SB-40.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Compound is not a regulated hazardous chemical.
4. (LD) indicates less than the detection limit. Detection limits are sample specific due to concentration samples of organics in samples. For the detection limit of a specific sample refer to the laboratory results in Appendix C.

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TABLE 48

EAST NEUTRALIZATION PIT  
ORGANIC ANALYSES

Sample Location	SB-41 and SB-42 (1)					
Sample Number	SS-124	SS-124 RA	SS-124 DUP	SS-124 DUP RA	SS-124 BLANK	SS-126
Sample Depth (ft)	0-3.0	0-3.0	0-3.0	0-3.0	NA	9.5-11.0
Parameter (ug/kg)						
Methylene Chloride	18	12	77	11	29	37
Acetone	38	35	100	32	LD	82
Toluene	15	10	LD	LD	LD	
Trimethylsilanol (2)	10 (J)	10 (J)	40 (J)	9 (J)	LD	60 (J)
1,1,2-Trichloro- 1,2,2-Trichloroethane	LD	100 (J)	LD	LD	LD	LD
Propane, 2-2'-Oxybis (isopropyl ether) (2)	LD	LD	LD	LD	LD	1000 (J)
Total VOCs	81	167	217	52	29	1179
OVA Readings	--	--	--	--	--	--

NOTES:

1. Sample numbers SS-124 and SS-126 were composite samples of soil borings SB-41 and SB-42.
2. Compound is not a regulated hazardous chemical.
3. Surrogate recovery of Toluene-D8 was outside QC limits due to matrix interference of samples SS-124 and SS-124 duplicate. Samples were reanalyzed (SS-124 RA and SS-124 duplicate RA and surrogate recoveries were again outside QC limits due to matrix interference. See "Sail Surrogate Percent Recovery Summary" in Appendix C.
4. LD indicates indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.

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TABLE 49

NEUTRALIZATION PIT AREA  
ORGANIC ANALYSES

Sample Location	SB-14	SB-14	SB-43	PH-1	PH-2&3
Sample Number	SS-117	SS-118	SS-114	PH-1	PH-2&3
Sample Depth (ft)	3.0-4.5	4.5-6.0	See Note 1	See Note 2	See Note 2
Parameter (ug/kg)					
Methylene Chloride	80	78	12	12	15
Acetone	85	76	22	24	23
Toluene	38	27	3 (J)	2 (J)	2 (J)
Propane, 2-2' Oxybis (Isopropyl Ether)	2000 (J)	2000 (J)	LD	LD	LD
4-Methyl-2 Pentanone	LD	LD	LD	LD	2 (J)
Xylene	LD	LD	LD	1 (J)	3 (J)
Total VOCs	2203	2181	37	38	42
OVA Readings	12	9.5	--	--	--

NOTES:

1. Samples were collected at 0.5-1.0 feet, 1.5-3.0 feet, 3-4.5 feet and 8-9.5 feet, and composited.
2. Sample No. PH-1 is a composite of soil samples collected from 0 to 5.0 feet. Sample No. PH 2-3 is a composite of soil samples collected at PH-2 and PH-3 from 1.5-3.0 feet.
3. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
4. (J) indicates compound identified at a concentration estimated below the detection limit.
5. (--) indicates parameter not analyzed.

ether, the VOC concentrations in these samples were similar to background. The concentration of isopropyl ether at a depth of 3.0 to 6.0 ft. in soil boring SB-14 was 2000 ug/kg, however, isopropyl ether was not detected in soil boring SB-43. The extent of isopropyl ether in the ground to the north of the neutralization pits is therefore limited to the area between SB-14 and SB-43. The vertical extent of isopropyl ether in the soil is approximately 9.5 to 11 ft.

Results of total metals analyses (Table 50) indicate elevated levels of iron and copper in samples collected from both pits. Iron concentrations ranged from 28,700 to 68,300 mg/kg. Copper concentrations ranged from 26 mg/kg to 657 mg/kg. Concentrations of other metals were similar to those detected in background soil samples.

Two soil samples (PH-1, PH-2-3) were collected to the north of the neutralization pits and analyzed for total metals. The analytical results are shown in Table 51 and are similar to the results of metals analyses on samples collected from the neutralization pits and background soil samples. Samples PH-2 and PH-2-3 were not analyzed for iron, copper or nickel.

#### 6.8 No Free Liquid Container Storage Area

Five soil borings were drilled along the perimeter of the container storage area located to the east of the HCC facility (Drawing No. 1). Samples were collected from the borings for organics and metals analyses. The results of the analyses are shown in Table 52. Groundwater was not encountered in the Well F borehole and Well F was installed in soil boring SB-46.

In general, VOC concentrations decreased with depth in soil borings SB-46, SB-47, SB-49 and in the Well F borehole. Elevated levels of total VOCs (146 mg/kg) were detected at 2 to 3.5 ft. in the Well F borehole, however, OVA readings approached background at approximately 17.0 ft. The 17 foot depth was not analyzed by the laboratory. Soil samples collected from soil boring SB-46 at 4.5 to

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TABLE 50

NEUTRALIZATION PITS  
TOTAL METALS ANALYSES

Sample Location	<u>West Pit</u>			<u>East Pit</u>		
	<u>SB-39 and SB-40 (1)</u>			<u>SB-41 and SB-42 (2)</u>		
Sample Number	NPS C-1	NPS C-2	NPS C-3	NPS C-4	NPS C-5	NPS C-6
Sample Depth (ft)	0-3.0	4.5-6.0	9.5-11.0	0-3.0	4.5-6.0	9.5-11.0
Parameter (mg/kg)						
Arsenic (*)	16	6.1	9.6	38	14	11
Barium (*)	98	55	45	98	54	51
Cadmium	LD	LD	3.4	4.9	LD	LD
Chromium (T) (R)	26	12	17	LD	38	15
Copper (R)	657	41	26	203	110	27
Iron	68,300	30,900	39,400	67,600	33,800	28,700
Lead	159	29 (+)	17	92 (+)	88 (+)	15 (S)
Mercury (R)	LD	LD	LD	0.12	LD	LD
Nickel	LD	LD	35	35	54	30
Selenium	LD	LD	LD	LD	LD	LD
Silver	LD	LD	LD	LD	LD	LD
Solids %	81	81	88	81	82	87

NOTES:

1. Sample numbers NPS C-1, NPS C-2, and NPS C-2 were composite samples of soil borings SB-39 and SB-40.
2. Sample numbers NPS C-4, NPS C-5, and NPS C-6 were composite samples of soil borings SB-41 and SB-42.
3. LD indicates less than the detection limit. For detection limits of a specific sample refer to the laboratory results in Appendix C.
4. R indicates that spike sample recovery was not within control limits.
5. + indicates that the correlation coefficient for method of standard addition is less than 0.995.
6. \* indicates that duplicate analysis areas not within control limits.
7. S indicates value determined by method of standard addition.



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TABLE 51

NEUTRALIZATION PIT AREAMETALS ANALYSES

Sample Location	PH-1	PH-3	PH-2 & PH-3
Sample Number	PH-1	PH-3	PH-2-3
Sample Depth	See Note 1	See Note 1	See Note 1
Parameter (mg/kg)			
Arsenic	17	14	21
Barium	59	53	99
Cadmium	7.1	LD	7
Chromium (T)	LD	32 (R)	324 (R)
Lead	44 (R)	20 (*)	72 (S)(*)
Mercury	LD	LD	LD
Selenium, (R)	LD	LD	LD (R)
Silver	LD (R)	9.9	LD
% Solids	84	76	86

NOTES:

1. Sample No. PH-1 is a composite of soil samples collected from 0 to 5.0 feet. Sample No. PH-2-3 is a composite of samples from 1.5 to 3.0 ft. at location PH-2 and PH-3. PH-3 is a composite of soil collected from 0 to 1.5 ft.
2. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory results in Appendix C.
3. R indicates that spike sample recovery was not within control limits.
4. \* indicates that duplicate analysis areas not within control limits.
5. (S) indicates determined by method of standard addition. PH-3 is a composite of soil collected from 0 to 1.5 ft.

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TABLE 52

CONTAINER STORAGE AREA  
ORGANIC ANALYSES

Sample Location	Boring Well F	SB-46	SB-46	SB-47	SB-47	SB-48	SB-49	SB-49
Sample Number	SS-29	SS-41	SS-45	SS-50	SS-52	SS-60	SS-63	SS-66
Sample Depth (ft)	2.0-3.5	4.5-6.0	21.0-21.4	3.0-4.5	9.0-10.5	16.5-17.0	3.5-5.0	16.5-16.8
Parameter (mg/kg)								
Methylene Chloride	41.0 (J)	51.0	0.051	3.4	2.6	0.017	19.0	0.008
Acetone	LD	LD	0.090	4.0	3.9	0.048	16.0	0.040
Trans-1,2-Dichloroethylene	LD	18.0 (J)	0.080	LD	LD	LD	LD	LD
2-Butanone	LD	LD	0.038 (J)	4.9	4.9	0.012 (J)	17.0	0.015
4-Methyl-2-Pentanone	LD	LD	LD	LD	LD	LD	LD	0.004 (J)
Toluene	17.0 (J)	230.0	0.081	12.0	LD	0.011	LD	0.006
Ethyl Benzene	9.0 (J)	230.0	0.027	2.7	LD	LD	LD	LD
Total Xylene	79.0 (J)	1800.0	0.220	5.2	LD	LD	LD	LD
Trimethylsilanol	LD	LD	0.030 (J)	LD	LD	0.020 (J)	LD	0.005 (J)
Hexane	LD	LD	0.060 (J)	LD	LD	LD	LD	LD
2-Methyl-Hexane	LD	LD	0.030 (J)	LD	LD	LD	LD	LD
1-Ethyl-4-Methyl Benzene	LD	LD	LD	LD	LD	LD	30.0 (J)	LD
Total VOCs	146	2329	0.707	32.2	11.4	0.108	82	0.078
OVA Readings	GT 1000	GT 1000	35	340	20	8	200	3.5

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Monitor Well F was installed in Soil Boring SB-46. No water was encountered during the drilling of Boring Well F.
4. Surrogate recoveries of Toluene-D8 and Bromofluorobenzene were outside QC limits due to matrix interference. See "Soil Surrogate Percent Recovery Summary" in Appendix C.
5. GT indicates greater than.

6.0 ft. showed a total VOC concentration of 2029 mg/kg which declined to 0.707 mg/kg at 21 ft. VOCs in soil samples collected from soil boring SB-47 at 3.0 to 4.5 ft. and 9.0 to 10.5 ft. were 32.2 mg/kg and 11.4 mg/kg, respectively.

VOC concentrations in soil boring SB-48 were at or near the concentrations of the background soil samples. OVA readings showed background over the entire depth (0.5 to 17.0 ft.) of this boring. VOC concentrations in samples collected at boring SB-49 were 82.0 mg/kg and 0.078 mg/kg at depths of 3.5 to 5.0 ft. and 16.5 to 16.8 ft., respectively.

Results of metals analysis of soil samples collected at or near the sample depths collected for organic analyses are shown in Table 53. Concentrations of arsenic, barium, cadmium, selenium and silver were similar to the metals background in soil. Elevated levels of barium, lead, chromium and mercury were detected in soil boring SB-46 at a depth of 4.5 to 6.0 ft. Mercury levels higher than background were detected at 2.0 to 3.5 ft. in samples from the Well F borehole and at 3.0 to 4.5 ft. in soil boring SB-47.

#### 6.9 API Tank Basin Area

Two soil borings were drilled to the east of the containment basin which is located above the API tank and samples were collected for organic and metals analyses. The results of the analyses are shown in Tables 54 and 55. Boring locations are shown on Drawing No. 1.

Concentrations of VOCs detected in samples from soil boring SB-50 were 0.19 mg/kg and 0.115 mg/kg at 3.5 to 5.0 ft. and 12.5 to 13.5 ft., respectively and were similar to those detected in background soil samples. Total VOCs in soil boring SB-51 were 523.3 mg/kg at a depth of 8.0 to 9.5 ft., however, at 16.5 to 17.0 ft., the VOC concentrations decreased to 0.084 mg/kg, similar to background.

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TABLE 53

CONTAINER STORAGE AREA  
METALS ANALYSES

Sample Location	Well F Boring	SB-46	SB-47	SB-48	SB-49
Sample Number	SS-30	SS-41	SS-50	SS-60	SS-63
Sample Depth (ft)	2.0-3.5	4.5-6.0	3.0-4.5	16.5-17.0	3.5-5.0
Parameter (mg/kg)					
Arsenic (*)	16	12	12(S)	8.8	10
Barium (*)	78	234	80	36	72
Cadmium	LD	4.8	LD	LD	LD
Chromium (T) (R)	15	74	19	15	14
Lead	76	199	136	18	27
Mercury (R)	1.5	0.56	0.13	LD	LD
Selenium	LD	LD	LD	LD	LD
Silver	LD	LD	LD	LD	LD
% Solids	76	72	80	96	83

NOTES:

1. (\*) indicates duplicate analysis was not within control limits.
2. (R) indicates spike sample recovery was not within control limits.
3. (S) indicates concentration determined by method of standard addition.
4. LD indicates less than the detection limit. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
5. Monitor Well F was installed in soil boring SB-46. No water was encountered during the drilling of Boring Well F.

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TABLE 54

API TANK AREAORGANIC ANALYSES

Sample Location	SB-50	SB-50	SB-50	SB-50	SB-51	SB-51	SB-51
Sample Number	SS-77	SS-77 Dup.	SS-77 Blank	SS-79	SS-70	SS-70 RA	SS-72
Sample Depth (ft)	3.5-5.0	3.5-5.0	NA	12.5-13.5	8.0-9.5	8.0-9.5	16.5-17.0
Parameter (mg/kg)							
Methylene Chloride	0.034	0.023	0.031	0.018	4.3	4.2	0.016
Acetone	0.150	0.041	0.010	0.044	11.0	10.0	0.027
Tetrachloroethylene	LD	LD	LD	LD	3.0	3.0	LD
Toluene	0.006	0.023	0.004(J)	0.037	100.0	110.0	0.024
Ethyl Benzene	LD	LD	LD	LD	55.0	62.0	0.002(J)
Xylene	LD	LD	LD	LD	350.0	370.0	0.011
1,1,1 Trichloroethane	LD	LD	0.006	LD	LD	LD	LD
1,1,2 Trichloro-							
1,2,2 Trichfluoroethane	LD	LD	LD	0.008(J)	LD	LD	LD
Trimethylsilanol	LD	LD	LD	0.008(J)	LD	LD	LD
Trans-1,2 Dichloroethylene	LD	LD	LD	LD	LD	LD	0.004(J)
Total VOCs	0.19	0.087	0.051	0.115	523.3	559.2	0.084
OVA Readings	3.5	--	--	2.0	400	--	15

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. NA indicates not applicable.
4. Dup. indicates duplicate analysis
5. -- indicates parameter not analyzed.
6. RA indicates reanalysis by the laboratory. The percent difference for toluene was 33% in the laboratory's continuing calibration. The allowable limit is 25%, therefore actual Toluene concentrations may be slightly higher than reported for sample number SS-70 only. Surrogate recovery of Bromofluorobenzene was outside QC limits, due to matrix interference of sample SS-70. Sample number SS-70 was reanalyzed (SS-70RA). Surrogate for SS-70RA was also outside QC limits, due to matrix interference. See "Soil Surrogate Percent Recovery Summary" in Appendix C.

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TABLE 55

API TANK AREA  
METALS ANALYSES

Sample Location	SB-51
Sample Number	SS-70
Sample Depth (ft)	8.0-9.5
Parameter (mg/kg)	
Arsenic	8.5 (S) (*)
Barium	54 (*)
Cadmium	LD
Chromium (T)	17 (R)
Lead	19
Mercury	LD (R)
Selenium	LD
Silver	LD
% Solids	82

NOTES:

1. (\*) indicates duplicate analysis was not within control limits.
2. (R) indicates spike sample recovery was not within control limits.
3. (S) indicates concentration determined by method of standard addition.
4. LD indicates less than the detection limit. For the detection limit of a specific sample refer to the laboratory results in Appendix C.

Metals analyses on the soil sample showing the highest concentration of organics in soil boring SB-51 showed less than background (Table 55).

#### 6.10 Storm Water Collection System

A schematic of the HCC storm water drainage system is shown in Drawing No. 3. The drainage system discharges at Outfall No. 001. The storm water system was sampled by HCC personnel under EA's guidance in an effort to identify sources of elevated effluent levels of BOD, TOC and COD. Samples of standing water were collected at various points along the storm water collection system during dry weather periods and samples from the outfall were collected during dry and wet weather periods.

Sample COD was measured as the indicator parameter. COD analyses were performed by the HCC laboratory (Tables 56 and 57). Elevated levels of COD were detected in storm water collected from the area of the shipping dock and the east drive <sup>Cistern area.</sup> main interceptor. In addition, water seeping from the ground around the manhole of the east drive main interceptor and flow into the manhole also contained elevated levels of COD.

The results of Outfall 001 sampling and COD analyses versus flow rates show that there are elevated COD levels (2850 mg/l) under low flow conditions and COD levels decrease as the flow rate increases in wet weather (Table 57).

Visual inspection of the storm water collection system showed the following:

1. During dry weather periods, flow was observed from the north-south piping run into the east drive main interceptor manhole.

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TABLE 56

STORM WATER COLLECTION SYSTEM

<u>Sampling Location Number</u>	<u>July 2, 1985</u>	<u>COD (mg/l)</u>
		<u>September 6, 1985</u>
1	260	100
2	160	90
3	0	200
4	4000	GT 6000
5	10	50
6A	GT 6000	GT 6000 <sup>3</sup>
6B	--	GT 6000 <sup>4</sup>
6C	--	GT 6000 <sup>5</sup>
7	3600	2600
Flow rate at outfall tank (gal/hr)	4	3

NOTES:

1. GT indicates greater than
2. (--) indicates no sample collected
3. Sample collected was standing liquid in the East Drive Main Interceptor.
4. Sample collected was liquid flow from the inlet of the North-South run at the East Drive Main Interceptor.
5. Sample collected was liquid seepage around the inlet of the East-West run at the East Drive Main Interceptor.



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TABLE 57

OUTFALL 001  
COD VS. FLOW RATE

<u>Date</u>	<u>Flow Rate (gal/hr)</u>	<u>COD (mg/l)</u>
6/28/85	9	2600
7/5/85	3	4000
7/5/85	180	675
7/9/85	4	2500
7/10/85	3600	0
7/10/85	257	10
7/10/85	95	50
7/11/85	7	1000

2. At the east drive main interceptor, there was no flow through the piping interconnecting the interceptor manhole and the API tank. Seepage around the interconnecting piping in the manhole of the east drive main interceptor was observed.
3. There was no flow through the east-west piping at the east drive main interceptor during dry weather periods. Seepage around the connection between the piping and the interceptor manhole was observed.

Sampling and laboratory analyses of the 001 outfall was performed by EA and OEPA. The analytical results of analyses are included in Tables 58 and 59. The flow rate at the outfall when OEPA collected its sample is not known and OEPA exceeded its sample holding time. The outfall flow rate when it was sampled by EA in October 1986 was approximately 30 gallons per hour. VOCs were detected in the discharge in samples collected by OEPA and EA.

#### 6.11 Groundwater and Surface Water Monitoring Results

All new and existing monitoring wells were sampled by EA in accord with the protocol described in EA's November 1985 report well locations are shown on Drawing No. 1. At the time this report was prepared, three quarterly sampling events were completed. Third quarter sampling of a limited number of wells was conducted in February 1987, pending USEPA and OEPA review of existing data.

Monitoring data for the May 1986 sampling are shown in Tables 60 and 61. The HCC upgradient well is identified as SW-1 which contained acetone (0.014 mg/l) and methylene chloride (0.001 mg/l) at concentrations are less than detected in the laboratory and field blanks.

As shown in Table 60, the highest levels of VOCs were detected at Monitoring Well C (methylene chloride 1300 mg/l). Other organics may be present at lower concentrations, but could not be detected at the

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TABLE 58

OUTFALL 001 SAMPLING RESULTS

Sample Location	Outfall 001
Sample Number	OP-001
Sample Date	10/2/86
Parameter (ug/l)	
Acetone	11,000
Methylene Chloride	2,800
Toluene	560 (J)
2-Butanone	3,300
4-Methyl, 2-Pentanone	17,000
TOC	67.4
TOX	1.3

309 ph

34.6 ppm  
VOC

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.

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TABLE 59

STATE ANALYSES

<u>Chemical</u> <u>(ug/l)</u>	<u>Upstream</u>	<u>Effluent</u> <u>(001 Outfall)</u>	<u>Downstream</u>
1,1-dichloroethane	K0.8	82.7	3.9
1,1,1-trichloroethane	6.6	440	20.5
1,1-dichloroethene	K1.1	16.5	K1.1
✓ trans-1,2-dichloroethene	18.5	98.8	21.7
trichloroethene	1.9	493	8.3
tetrachloroethene	12.2	38.2	2.1
vinyl chloride	K0.9	9.9	10.9
methylene chloride	K2.0	7,272	349
benzene	K0.7	19.1	K0.7
ethylbenzene	K0.2	162	0.5
toluene	0.6	1,779	4.1
1,2-dichlorobenzene	K0.5	22.7	0.5
1,3-dichlorobenzene	K0.2	3.6	K0.2
N-nitrosodiphenylamine	0.3	0.3	0.4
dimethylphthalate	K0.4	1.8	K0.4
di-n-butylphthalate	K0.5	0.5	K0.5
butylbenzylphthalate	K0.3	0.3	K0.3
bis(2-ethylhexyl)phthalate	1.5	3.8	2.6
naphthalene	K0.2	2.9	K0.2
phenanthrene	0.3	0.6	0.6

phenol

K0.7

16.0 10.5 ppm  
VOCK0.7 0.4 ppm  
VOCNOTES:

1. Grab samples were collected by the Ohio EPA on March 28, 1985, and were analyzed for volatiles and acid and base neutral extractables. All samples exceeded QA/QC holding times. K = less than.
2. This table is taken from OEPA's report, "Toxicity Evaluation Report on Surface Water Discharges," dated September 22, 1986, marked "Draft Subject to Revision".



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TABLE 60

GROUNDWATER MONITORING RESULTS  
ORGANIC ANALYSES  
MAY 1986 (FIRST QUARTER)

*Bkgd*

Sample Location	SW-1	SW-2 <sup>(3)</sup>	SW-3	SW-4	A	B	B, Duplicate	B, Blank	C
Sample Number	GW-7	--	GW-5	GW-4	GW-1	GW-2	GW-2	GW-2	GW-3
Sample Date	5/17/86	--	5/17/86	5/16/86	5/16/86	5/16/86	5/16/86	5/16/86	5/16/86
Parameter (mg/l)									
Methylene Chloride	0.001 (J)	--	0.003 (J)	0.042	LD	440.0	490.0	0.010	1300.0
Acetone	0.014	--	0.020	0.047	LD	92.0	LD	0.056	LD
2-Butanone	LD	--	LD	0.023	LD	LD	LD	0.013	LD
Toluene	LD	--	LD	0.005	0.030	LD	LD	0.004 (J)	LD
1,1 Dichloroethane	LD	--	LD	0.016	0.006	LD	LD	LD	LD
Xylene	LD	--	LD	LD	0.030	LD	LD	0.002 (J)	LD
Ethyl Benzene	LD	--	LD	LD	0.005	LD	LD	LD	LD
4-Methyl-2-Pentanone	LD	--	LD	0.009 (J)	LD	LD	LD	LD	LD
Propane 2,2-Oxybis (Isopropyl Ether) (4)	LD	--	LD	0.080 (J)	LD	LD	LD	LD	LD
TOC	2.8	--	73.9	22.6	1.4	59.8	71.1	1.4	107.0
TOX	0.040	--	0.270	0.200	0.010	22.0	180.0	LD	120.0

*0.010?  
Black Clay  
with wood.*

NOTES:

- LD indicates less than the detection limit.
- Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
- No sample was collected for analyses because bailer could not be retrieved from well SW-2. Problem was rectified in September 1986 and sample was collected for analyses.
- Propane 2,2' - oxybis (isopropyl ether) is not regulated as a hazardous substance.
- (J) indicates compound identified and concentration estimated below the detection limit.

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TABLE 61

GROUNDWATER MONITORING RESULTS  
INORGANIC ANALYSES  
MAY 1986 (FIRST QUARTER)

Sample Location	SW-1	SW-2 <sup>(2)</sup>	SW-3	SW-4	A	B	B, Duplicate	B, Blank	C
Sample Number	GW-7	--	GW-5	GW-4	GW-1	GW-2	GW-2	GW-2	GW-3
Sample Date	5/17/86	--	5/17/86	5/16/86	5/16/86	5/16/86	5/16/86	5/16/86	5/16/86
Parameter (mg/l)									
Arsenic	LD	--	LD	LD	LD	LD	LD	LD	LD
Barium	LD	--	LD	0.210	LD	0.190	0.190	LD	0.100
Cadmium	LD	--	LD	LD	LD	LD	LD	LD	LD
Chromium	LD	--	LD	LD	LD	LD	LD	LD	LD
Lead	LD	--	LD	LD	LD	LD	LD	LD	LD
Mercury	LD	--	LD	LD	LD	LD	LD	LD	LD
Selenium (3)	LD	--	LD	LD	LD	LD	LD	LD	LD
Silver	LD	--	LD	LD	LD	LD	LD	LD	LD
pH	8.05	--	7.39	7.08	6.20	6.06	--	6.96	5.78
Conductivity-umohs/cm	3600	--	9250	4750	8750	6990	--	5.1	4700

NOTES:

1. LD indicates less than the detection limit. Detection limits are provided in the laboratory reports in Appendix C.
2. See Note 3, Table 60.
3. Spike sample recovery for selenium analysis was not within the control limits.
4. -- indicates parameter not analyzed.

detection limit required to identify the concentration of methylene chloride. Methylene chloride concentrations decrease from Well C to Well B, where the concentration was 440 mg/l. In addition to methylene chloride, a sample from Well B also contained acetone (92 mg/l) and a trace level of 1,1-dichloroethane (0.006 mg/l). However, neither acetone nor 1,1-dichloroethane were detected in a duplicate sample collected from Well B. Well SW-4 contained trace levels of methylene chloride (0.042 mg/l) as well as other VOCs. Well A contained no detectable methylene chloride, but did contain low concentrations of toluene (0.03 mg/l), 1,1-dichloroethane (0.016 mg/l), xylene (0.03 mg/l) and ethylbenzene (0.005 mg/l).

Well SW-3 contained acetone and methylene chloride at concentrations of 0.02 mg/l and 0.003 mg/l, respectively which is less than detected in both the field and laboratory blanks.

TOC and TOX values were greater than upgradient values in Wells SW-3, SW-4, Well B and Well C. The groundwater sample collected from Well SW-3, SW-4, Well B and Well C had an odor similar to that produced by anaerobic decomposition of organic matter.

Table 61 shows the inorganic analytical results from the May 1986 sampling. Except for barium, no heavy metals were detected in any of the groundwater samples. Barium was detected in Wells SW-4, Well B, Well B Duplicate and Well C groundwater samples at 0.21 mg/l, 0.19 mg/l, 0.19 mg/l and 0.1 mg/l, respectively.

The pH of the upgradient well was 8.05. Lower pH values were measured in each of the groundwater samples collected from the downgradient monitor wells. The lowest pH values were detected at Well C (5.78).

Monitoring data for the September/October 1986 sampling are shown in Tables 62 and 63. Upgradient concentrations of methylene chloride and toluene were 0.180 mg/l and 0.002 mg/l, respectively. Samples from Wells B, C, F and G contained elevated levels of VOCs. Wells C,

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TABLE 62

GROUNDWATER MONITORING RESULTS  
ORGANIC ANALYSES  
SEPTEMBER/OCTOBER 1986 (SECOND QUARTER)

Sample Location	SW-1	SW-2	SW-3	SW-4	A	B	C	E	F	F, Duplicate	F Blank	G
Sample Number	GW-1	GW-9	GW-2	GW-4	GW-3	GW-5	GW-6	GW-10	GW-7	GW-7	GW-7	GW-8
Sample Date	9/20/86	10/1/86	9/20/86	9/20/86	9/20/86	9/21/86	9/21/86	10/2/86	10/1/86	10/1/86	10/1/86	10/1/86
Parameter (mg/l)												
Methylene Chloride	0.180	0.007	0.100	0.170	0.170	610.0	1500.0	LD	0.047	0.007	LD	270.0
Toluene	0.002(J)	LD	LD	0.003(J)	0.002(J)	LD	LD	LD	LD	0.006	LD	3.6(J)
Xylene	LD	LD	LD	LD	LD	LD	LD	LD	0.012	0.017	LD	LD
1,2 Diethoxyethane	LD	LD	0.020(J)	LD	LD	LD	LD	LD	LD	LD	LD	LD
1,1 Dichloroethane	LD	LD	LD	0.012	LD	LD	LD	LD	LD	LD	LD	LD
2-Methyl, 2-Propanol	LD	LD	LD	0.010	LD	LD	LD	LD	LD	LD	LD	LD
2,2' Propane, Oxybis	LD	LD	LD	0.100	LD	LD	LD	LD	LD	LD	LD	LD
Vinyl Chloride	LD	LD	LD	LD	LD	LD	LD	LD	0.024	0.030	LD	LD
Trans, 1,2,- Dichloroethylene	LD	LD	LD	LD	LD	LD	LD	LD	0.240	0.250	LD	LD
TOC	7.6	20.9	83.8	9.6	1.3	83.8	134.0	4.6	5.5	5.7	1.1	44.5
TOX	LD	0.022	0.180	0.016	LD	25.0	40.0	0.026	0.170	0.160	0.011	53.0

NOTES:

1. Wells E, F and G were installed in September 1986.
2. LD indicates less than the detection limit.
3. Isopropyl ether (2-2' Oxybispropane) is not a regulated hazardous chemical.
4. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory reports in Appendix C.



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TABLE 63

GROUNDWATER MONITORING RESULTS  
INORGANIC ANALYSES  
SEPTEMBER/OCTOBER 1986 (SECOND QUARTER)

Sample Location	SW-1	SW-2	SW-3	SW-4	A	B	C	E	F	F, Duplicate	F Blank	G
Sample Number	GW-1	GW-9	GW-2	GW-4	GW-3	GW-5	GW-6	GW-10	GW-7	GW-7	GW-7	GW-8
Sample Date	9/20/86	10/1/86	9/20/86	9/20/86	9/20/86	9/21/86	9/21/86	10/2/86	10/1/86	10/1/86	10/1/86	10/1/86
Parameter (mg/l)												
Arsenic (I)	LD	LD	LD	LD	LD	0.018	LD	LD	LD	LD	LD	LD
Barium	LD	0.070	LD	LD	LD	0.280	0.090	LD	0.090	0.090	LD	0.140
Cadmium	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD
Chromium (T)	0.010	0.018	0.012	LD	LD	LD	LD	0.012	0.022	LD	LD	LD
Lead (I) (2)	LD	0.014	.006	LD	0.018	LD	LD	LD	LD	0.010	LD	LD
Mercury	0.001	0.0027	0.0003	0.0006	0.001	0.0009	0.0008	0.0007	0.0005	--	LD	0.0003
Selenium	LD	LD	(S)	LD	LD	LD	LD	LD	LD	LD	LD	LD
Silver	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD
pH	7.12	6.84	7.54	7.10	6.32	6.11	5.87	6.37	7.74	--	--	6.82
Conductivity-umohs/cm	3000	1350	9500	3500	1400	3250	1700	1750	1800	--	--	4000

NOTES:

1. Spike sample recovery was not within the control limits.
2. Duplicate analysis was not within the control limits.
3. NA is not applicable.
4. -- indicates parameter not analyzed
5. Detection limits are provided in the laboratory reports in Appendix C.
6. (S) indicates concentration determined by method of standard addition.

B and G contained methylene chloride at concentrations of 1500 mg/l, 610 mg/l and 270 mg/l, respectively. In addition to methylene chloride, the sample from Well G contained 3.6 mg/l of toluene.

The sample from Well F contained less methylene chloride than the upgradient well. The Well F sample also contained trans, 1,2-dichloroethylene at 0.24 mg/l, vinyl chloride (0.024 mg/l) and xylene (0.012 mg/l). No VOCs were detected at Well E and Well SW-2 contained a trace level of methylene chloride at 0.007 mg/l. The Well SW-4 sample contained low levels of VOCs.

Results of heavy metals analyses, pH and conductivity are shown in Table 63. Cadmium, selenium or silver were not detected in any of the groundwater samples. Monitoring Well B contained 0.018 mg/l of arsenic. No other samples contained arsenic.

Barium was detected in samples from Wells B, C, E and F at concentrations ranging from 0.06 mg/l to 0.028 mg/l. Chromium was detected in samples collected from SW-1 (upgradient), SW-2, SW-3, E and F. Concentrations ranged from 0.01 mg/l (SW-1) to 0.022 mg/l (Well F). Lead was detected in samples from Wells SW-2, Well A and the Well F duplicate at concentrations of 0.014 mg/l, 0.018 mg/l and 0.01 mg/l, respectively. Mercury was detected in all groundwater samples, except the Well F duplicate. Concentrations ranged from 0.0003 mg/l in Well G to 0.0027 mg/l in Well SW-2. The concentration of mercury in upgradient groundwater was 0.001 mg/l.

The pH of groundwater samples decreased from upgradient to downgradient with the lowest pH value measured at Well C (5.87).

In addition to the heavy metals, additional inorganic analyses were performed on select groundwater samples collected in September/October 1986. Results of these analyses are shown in Table 64.

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TABLE 64

GROUNDWATER MONITORING RESULTS  
INORGANIC ANALYSES  
SEPTEMBER/OCTOBER 1986

Sample Location	SW-1	SW-2	SW-3	SW-4	A	B	C	E	F	F, Duplicate	F Blank	G
Sample Number	GW-1	GW-9	GW-2	GW-4	GW-3	GW-5	GW-6	GW-10	GW-7	GW-7	GW-7	GW-8
Sample Date	9/20/86	10/1/86	9/20/86	9/20/86	9/20/86	9/21/86	9/21/86	10/2/86	10/1/86	10/1/86	10/1/86	10/1/86
Parameter (mg/l)												
Copper	0.037	0.488	0.025	--	--	--	--	0.074	0.023	0.031	0.023	0.028
Iron	1.2	19.60	0.200	--	--	--	--	23.8	0.580	0.670	LD	--
Nickel	LD	LD	LD	--	--	--	--	LD	LD	LD	LD	0.179
Manganese	--	6.720	--	--	--	--	--	2.420	0.068	0.062	LD	3.580
Zinc	--	1.230	--	--	--	--	--	0.367	0.054	0.052	0.041	2.340
Chloride	16.0	84.0	330.0	--	--	--	--	530.0	170.0	170.0	LD	490.0
Fluoride	0.7	0.30	0.20	--	--	--	--	0.2	0.80	0.70	LD	0.70
Phosphorus (T)	LD	0.20	LD	--	--	--	--	LD	LD	LD	LD	LD
Sulfate	480.0	93.0	2200.0	--	--	--	--	135.0	77.0	75.0	LD	142.0

NOTES:

1. LD indicates less than the detection limit.
2. -- indicates parameter was not analyzed.
3. Refer to laboratory results in Appendix C for detection limits.

Copper was detected at concentrations greater than upgradient (0.037 mg/l) in samples from Wells SW-2 (0.488 mg/l) and Well E (0.074 mg/l). Concentrations of iron in samples from Wells SW-2 and E (19.6 mg/l and 23.8 mg/l) were greater than upgradient concentrations (1.2 mg/l). Nickel was detected in Well G at 0.179 mg/l. No nickel was detected in the upgradient groundwater sample.

Samples from Wells SW-2, E, F and G were analyzed for manganese. The Well F sample contained 0.068 mg/l. Wells SW-2, E and G contained 6.72 mg/l, 2.42 mg/l and 3.58 mg/l, respectively. Well F contained 0.054 mg/l of zinc and Wells SW-2, E and G contained 1.23 mg/l, 0.367 mg/l and 2.34 mg/l of zinc.

Downgradient chloride concentrations were greater than upgradient concentrations (16.0 mg/l) in Wells SW-2, SW-3, E, F and G. Results of fluoride analysis showed that the samples analyzed contained less than upgradient concentrations, except for the Well F sample which contained 0.8 mg/l of fluoride. The upgradient concentration was 0.07 mg/l.

Results of total phosphorous analysis show that phosphorous was detected only in the groundwater sample collected from Well SW-2 (0.02 mg/l). Results of sulfate analysis showed that the upgradient groundwater contained 480 mg/l. Downgradient wells, except SW-3, contained less than upgradient sulfate concentrations. Well SW-3 contained 2200 mg/l of sulfates.

Pending USEPA and OEPA review of existing groundwater data, it was agreed that limited third quarter groundwater sampling would be performed. A decision was made to sample wells at the outside perimeter of a suspected methylene chloride plume emanating from the tank farm. The sampling results are shown in Table 65.

As shown, low levels of VOCs were detected in Wells A, SW-3 and SW-4. Well G, located at the tributary to Tinker's Creek contains

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TABLE 65

GROUNDWATER MONITORING RESULTS  
ORGANIC ANALYSES  
FEBRUARY 1987 (THIRD QUARTER)

Sample Location	Well A	Well A Duplicate	SW-3	SW-4	Well G
Sample Number	W-1	W-1A	W-2	W-3	W-4
Sample Depth (ft)	2/20/87	2/20/87	2/20/87	2/20/87	2/20/87
Parameter (mg/l)					
Methylene Chloride	LD	LD	0.005	0.230	730
Acetone	0.026	0.029	0.004 (J)	0.190	730
Vinyl Chloride	LD	LD	LD	0.012	LD
1,1 Dichloroethane	0.007	0.006	LD	0.013 (J)	LD
Trans, 1-2 Dichloroethylene	LD	LD	LD	0.014 (J)	LD
Ethyl Ether	LD	LD	0.022 (J)	LD	LD
1,4-Dioxane	LD	LD	0.009 (J)	LD	LD
Isopropyl Ether (3)	LD	LD	LD	0.097 (J)	LD

NOTES:

1. LD indicates less than the detection limit.
2. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
3. Isopropyl ether is not regulated as a hazardous substance.
4. (J) indicates compound identified and concentration estimated below the detection limit.



elevated levels of acetone (730 mg/l) and methylene chloride (740 mg/l). Methylene chloride increased from 270 mg/l detected in October 1986. Acetone was not detected in previous samples from Well G.

#### 6.12 Surface Water Sampling

*What is outfall vs. air discharge impact?*

Surface water samples of the tributary to Tinkers Creek were collected by EA and sent to the laboratory for organics analysis. An upstream sample was collected to the east of the HCC facility, where the tributary enters the property through a culvert. A downstream sample was collected from the tributary at a location northwest of the HCC facility. The results are shown in Table 66.

*↑ where*

Acetone was the only VOC detected in the upstream sample (21 ug/l). This concentration was less than detected in the laboratory blanks. Acetone was not detected in the upstream duplicate or field blank samples. The downstream surface water sample contained trace levels of VOCs. Xylene, trans, 1,2-dichloroethane and isopropyl ether were detected in the downstream samples at concentrations of 4 ug/l, 8 ug/l and 10 ug/l, respectively.

The tributary to Tinkers Creek was also sampled by OEPA in 1985. The results of the OEPA's analyses are presented in Section 6.10, Storm Water Collection System. Surface water sampling by EA was conducted during a dry weather period. At this time, the flow rate of storm water Outfall No. 001 was 30 gal/hr. The flow rate of this outfall when it was sampled by OEPA is not known.

*Flow rate of Tinkers Creek?*

*see page 108 for outfall*

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TABLE 66

SURFACE WATER SAMPLING RESULTS  
ORGANIC ANALYSES

*What was flow rate for biolite etc. of Tinkers Creek Tributary.*

*30 gph*

*High TOL*

Sample Location	Upstream	Duplicate	Blank	Downstream
Sample Number	STR-1	STR-1	STR-1	STR-2
Sample Depth (ft)	10/2/86	10/2/86	10/2/86	10/2/86
Parameter (ug/l)				
Acetone	21	LD	LD	LD
<i>Methylene Chloride</i>	LD	LD	LD	4 (J)
Xylene	LD	LD	LD	8
<i>Toluene</i>	LD	LD	LD	10 (J)
Trans, 1,2 Dichloro-ethane	LD	LD	LD	68.1
<i>2-Butanone</i>	LD	LD	LD	0.062
Propane, 2-2' Oxybis	LD	LD	LD	
<i>4-methyl, 2-Pentanone</i>	18.8	26.2	1.5	
TOC (mg/l)	0.049	0.055	0.010	
TOX (mg/l)				

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory reports in Appendix C.
2. (J) indicates compound identified and concentration estimated below the detection limit.

## 7.0 DISCUSSION OF RESULTS

### 7.1 Solvent Tank Farm

The areal extent of VOCs detected in the soil in and around the tank farm and the cistern is shown in Figure 16. The vertical distribution and extent of VOCs in the soil are shown in cross sections A-A, B-B and C-C shown in Section 6.3. In general, the vertical extent of VOC contamination in the tank farm and to the east of the tank farm is the depth of groundwater (17 ft. to 24 ft.). The variations in concentrations, depth and in the particular compounds detected in the soil samples indicate that their occurrence is the result of surface spills which explains the variability in VOC concentrations by location and depth.

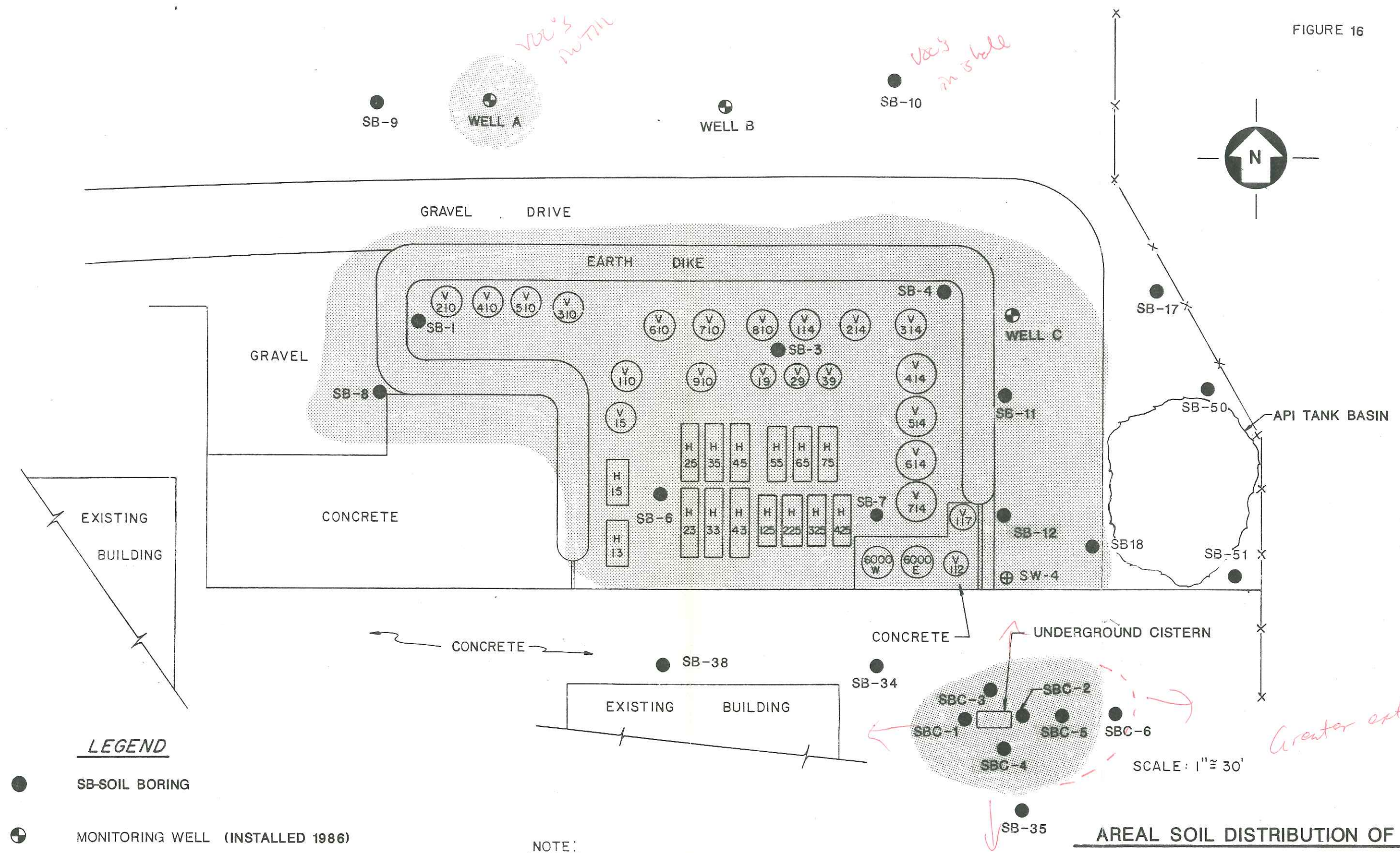
In general, the highest VOC concentrations in the tank farm were detected in and around soil boring SB-7 between grade and 4.5 ft. deep. From 4.5 ft. to the depth of weathered shale (approximately 12.0 to 13.0 ft.) in the tank farm, highest VOC concentrations were detected in the areas of soil borings SB-3 and SB-6.

Outside the berm of the tank farm, the highest concentrations of VOCs between grade and 4.5 ft. deep, were detected in the areas of soil borings SB-11 and SB-18. Between 4.5 ft. and the depth of groundwater (20.5 ft. to 24 ft.), highest VOCs were detected in the area of soil boring SB-11 at 12.0 to 13.5 ft.

Samples collected from the boring of Well A contained 49.72 mg/kg of VOCs at a depth of 7.5 to 9 ft. and it cannot be determined whether contamination in this area is due to tank farm operations or to a local spill. However, soil samples from Well A between 16.5 to 17 ft. and 20.0 to 20.5 ft. contained only 0.132 mg/kg and 0.171 mg/kg of VOCs. Samples collected between grade and 7.5 ft. were screened using



FIGURE 16



**LEGEND**

- SB-SOIL BORING
- ⊕ MONITORING WELL (INSTALLED 1986)
- ⊕ MONITORING WELL (INSTALLED 1982)

NOTE:  
STORAGE TANKS SHOWN IN  
APPROX. LOCATION.

**AREAL SOIL DISTRIBUTION OF VOC'S  
IN & AROUND TANK FARM & CISTERN**



the OVA, but were not submitted for laboratory analysis. OVA readings of samples collected at 0 to 1.5 ft. and 1.5 to 3.0 ft. were 3.4 ppm and 38.0 ppm, respectively. Groundwater samples collected at Well A contained only trace levels of VOCs.

Soil samples collected from soil boring SB-10 at or near the depth of groundwater (approximately 20 ft.) contained VOCs (43.1 mg/kg). These VOCs may be attributed to VOCs in groundwater, since low VOC levels were detected in the boring at 4.5 to 6.0 ft.

*M.C. Plume  
Not aligned with  
AW flow*

Metals analyses of three soil samples collected in the tank farm area characterized by the highest levels of VOCs show metals concentrations similar to background.

The extent and concentrations of contaminants in the groundwater around the tank farm are shown in Figures 17 and 18. These figures show methylene chloride isoconcentration contours based on first and second quarter groundwater sampling at the HCC site. *Source*

The highest concentration of methylene chloride was detected at Well C, located near the northeast corner of the tank farm. Based on the data collected to date and the site hydrogeology, the areal extent of methylene chloride in the groundwater is limited to the tributary to Tinkers Creek which is the point of groundwater discharge.

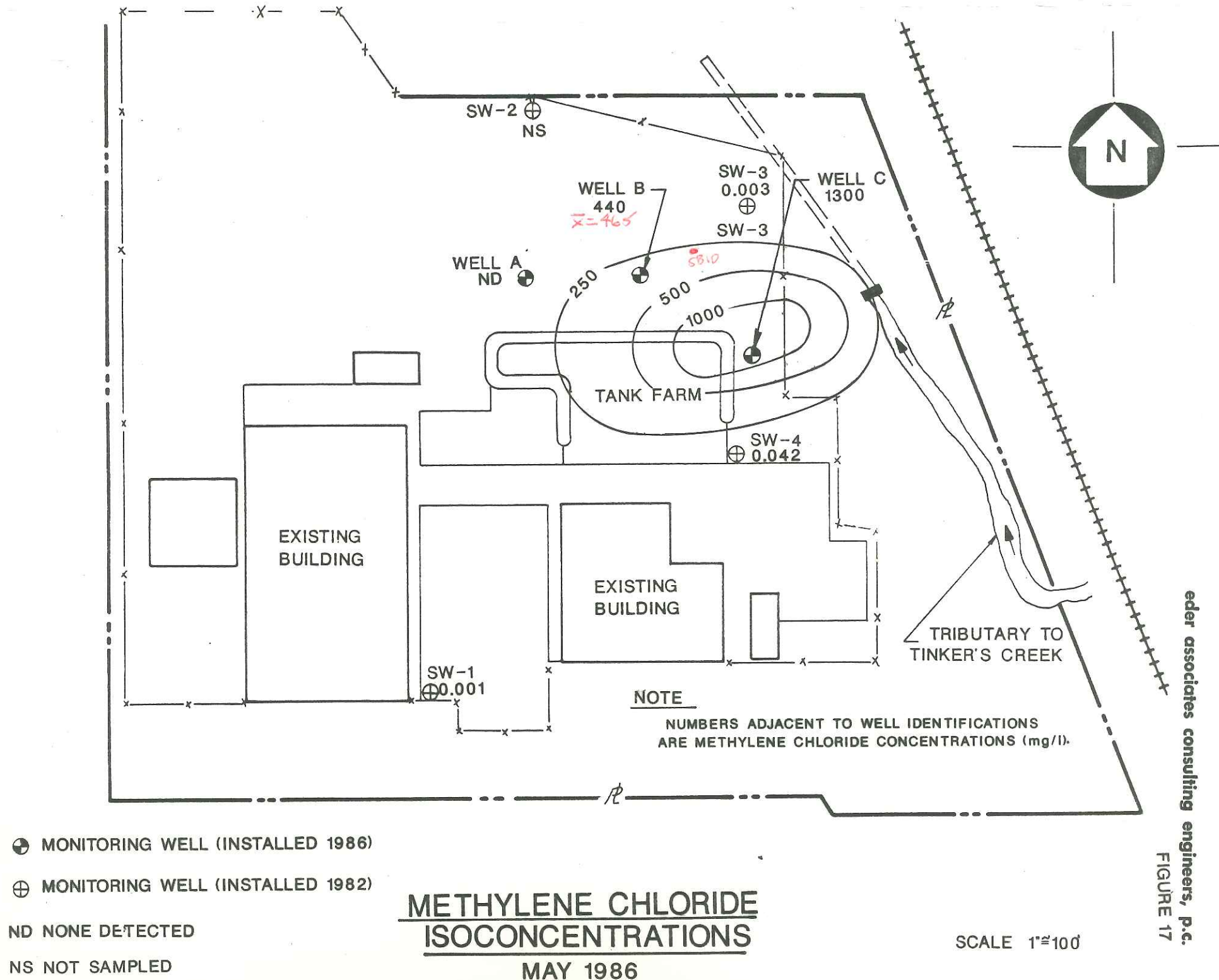
*? What about culvert and deeper flow!*

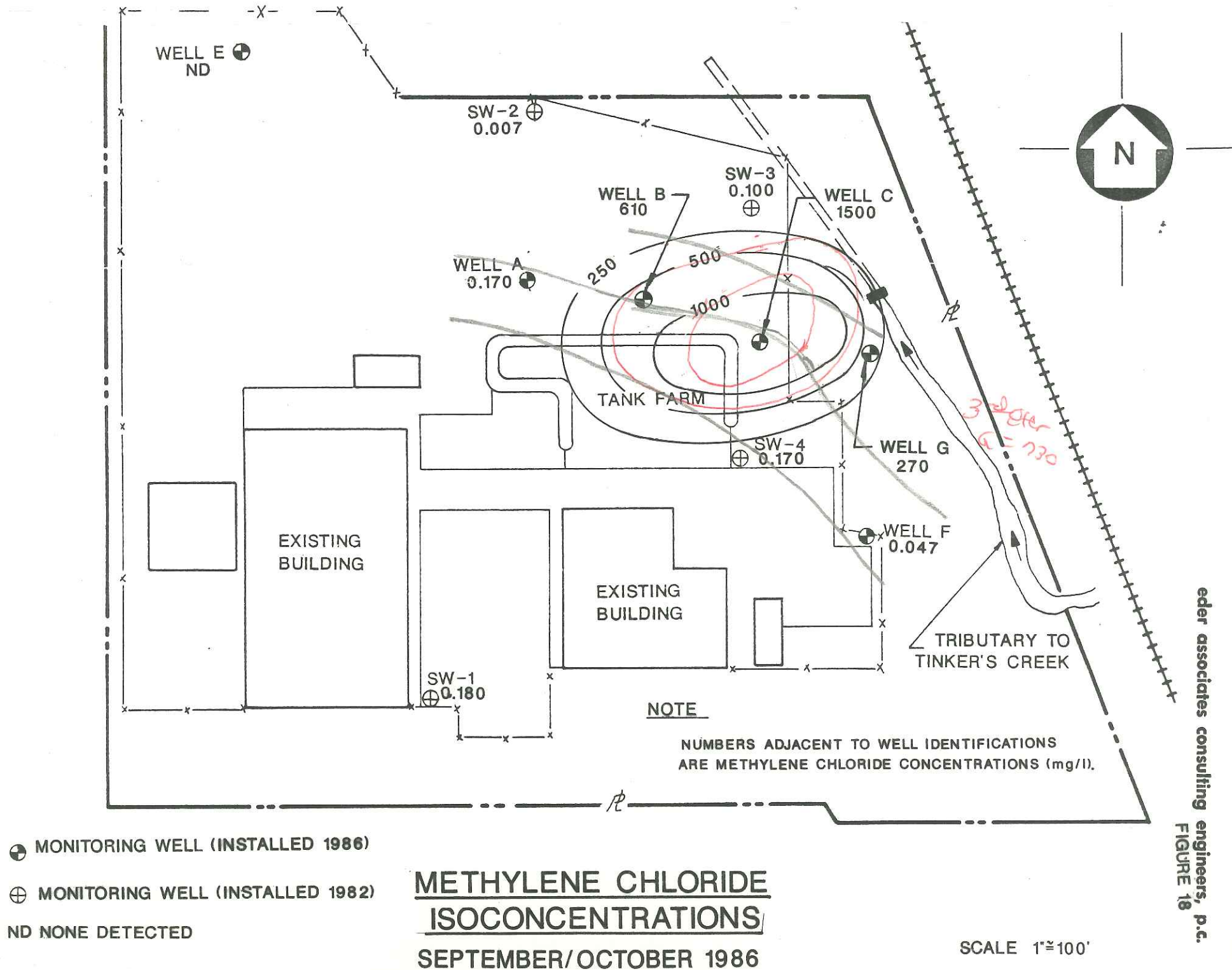
Surface water sampling and analysis in October 1986 did not reveal the presence of methylene chloride in upstream or downstream samples. Surface water sampling by the OEPA in 1985 showed an increase in downstream methylene chloride concentration, however, this was apparently the result of elevated levels of methylene chloride in the outfall.

*Is it not going in creek or aerated?*

The vertical extent of VOCs in the groundwater is limited to the weathered shale. The weathered shale is underlain by highly consolidated gray shale which forms a confining layer.

*Prove it!*







Methylene chloride was not the primary constituent detected in soil samples from the tank farm, however, the data indicates that the release of methylene occurred in the past and that there is probably no continuing source or release.

*How is this concluded?  
M.C. levels increasing.*

February 1987 analysis of Well G samples found acetone although none was detected in previous sampling. Acetone was detected in Well B at 92 mg/l in May 1986, but was not in the Well B duplicate. The anomalous occurrence of acetone in Wells B & G will be confirmed by additional sampling.

Physical conditions in the tank farm could increase the rate of migration of contaminants from the tank farm to groundwater. The two sumps in the tank farm are used to collect precipitation (perched water), which accumulates in the tank farm. These sumps are open at the bottom and top and the annular space between the outside of the sump pipe and the earth is not sealed. Precipitation accumulates in the northeast and southwest corners of the tank farm in the general area where the sumps are located. Moreover, grade is slightly lower in these corners of the tank farm, and these areas are natural collection points for any spills in the tank farm area.

*Are all tanks checked?*

*Sump Speeds?  
Depth?*

Perched water was encountered in the tank farm, around the cistern and beneath the process building. The tank farm is the apparent source of the perched water around the cistern and beneath the process building and perched water migrates through the fill around underground piping and beneath structures. Static levels of perched water in the tank farm are approximately 1.0 to 2.5 ft. above perched water levels in the cistern and beneath the building indicating the existence of a hydraulic gradient which causes perched water flow from the tank farm to the other areas.

*Also S.S. System*

*mostly Floaters*

## 7.2 Underground Cistern

The areal extent of VOC contamination in the soil around the cistern is shown in Figure 16 in Section 7.1. The vertical extent of

VOCs is shown in the cross section, Figure 15 in Section 6.6. In general VOCs were detected to the depth at which groundwater was encountered. Background VOC levels were approached in soil samples collected from boring SBC-6, SB-34 and SB-35 which generally bound the soil contamination in the area of the cistern.

Perched water with a floating a layer of mineral spirits was observed entering the cistern through and around the inlet pipe. Borings drilled through the floor of the process building identified the presence and general extent of the mineral spirits and perched water that migrates to the cistern along and in the interconnecting piping. The occurrence of perched water under the plant is apparently limited to subsurface areas that are backfilled with permeable material (i.e., sand) particularly around underground piping. Perched water was not encountered in soil borings SB-34 and to the east of the process building.

Analysis of water in the cistern and perched water beneath the plant shows the presence of methylene chloride and various ketones in concentrations which suggest a common origin. Contaminants in perched water under the building and in and around the cistern are reasonably linked to the past operation of the cistern and to the interconnected floor drain system in the plant. These drains are now sealed. Possible additional sources of contamination in the perched water are from standing liquid in the pump room and distillation area where liquid could seep through the concrete floor.

*Migration from tank farm too!*

VOC contaminants were detected in the groundwater sample collected at Well F. The VOCs included methylene chloride (0.47 mg/l), xylene (0.012 mg/l), vinyl chloride (0.024 mg/l) and trans, 1,2-dichloroethylene (0.240 mg/l). The concentration of methylene chloride detected in Well F was less than the background upgradient well. It is reasonable to expect that contamination in the soil and in perched water in and around the cistern would be reflected in the groundwater at Well F by the presence of ketones and methylene chloride. However, these contaminants were not detected in groundwater at Well F.

*Not in GW flow path from cistern.*

*might not detect floaters. Boring Well F has VOC's in surface sand fill overlying till some @ SB46 (Well F). Many floaters*

### 7.3 "Chem-Pack" Fill

The "Chem-Pack" material used to grade the site varies in depth from 1.0 ft. to 9.0 ft. with a maximum depth of 15 ft. in the area of soil boring SB-21.

The primary constituents in the "Chem-Pack" are iron, manganese, chromium, zinc and copper. EP toxicity tests showed low leachability of the metals from the "Chem-Pack" material and barium, which was detected at a low level (0.27 mg/l), was the only EP toxic metal detected in the leachate. Based on the EP toxicity results, the "Chem-Pack" does not exhibit EP toxic characteristics.

Leachate from the "Chem-Pack" material contained high levels of sulfate. However, the "Chem-Pack" is neutralized pickle liquor which would be expected to contain calcium sulfate, a product of lime neutralized pickle liquor.

Metals at concentrations similar to those detected in the "Chem-Pack" were also found in soil approximately three ft. below the "Chem-Pack". However, EP toxicity tests show that these metals are not readily leachable. The occurrence of metals found in the soil at this depth is likely the result of mixing "Chem-Pack" and soil during surface grading operations.

Two anomalous samples were encountered while drilling in the "Chem-Pack" area. The samples appeared to be foundry sand, which may be an artifact from filling and grading and a variant of the "Chem-Pack" material with a higher concentration of chromium and lime. Neither of the anomalous samples were EP toxic.

Samples from Well SW-3, located downgradient of the "Chem-Pack" fill area showed elevated levels of sulfates and chlorides and these parameters were also detected in "Chem-Pack" leachate.



Well SW-3 contained similar EP toxic metals concentrations to background, which shows that EP toxic metals are not leached from the "Chem-Pack" to the soil and groundwater. "Chem-Pack" is apparently a source of copper and iron detected in downgradient groundwater.

The occurrence of elevated levels of sulfates and chlorides in groundwater is limited to the area downgradient of the "Chem-Pack". Iron found in groundwater at Well SW-2 originates in the "Chem-Pack" area and/or at the northwest fill.

#### 7.4 Northwest Fill

The northwest fill is made up of construction debris, foundry sand and slag containing iron, zinc, lead, manganese, copper and nickel. EP toxicity tests on fill samples showed levels of metals at concentrations up to one hundred times less than EP toxic concentrations. No VOC or PAH compounds were detected in the fill at levels above background.

Monitor Well E located downgradient of the northwest fill contained an elevated level of iron probably originating from foundry sand and/or slag.

#### 7.5 Neutralization Pits

The major constituent in samples from both pits was iron. Copper was detected at 657 mg/kg in the west pit and at 203 mg/kg in the east pit. Nickel was detected in both pits at 54 mg/kg and 35 mg/kg. Other metals were detected at concentrations similar to background. EP toxicity tests were not performed on neutralization pit samples.

Monitor well SW-2 is located downgradient of the neutralization pits and "Chem-Pack" and shows elevated levels of iron and copper. The neutralization pits may have in the past or may presently be contributing to the iron and copper detected in downgradient Well SW-2.



The USEPA expressed concern that organic solvents may have been disposed of in the neutralization pits. The plant operating records indicated that isopropyl ether was the only organic product treated in the neutralization pits and it is not a hazardous regulated substance. Isopropyl ether was detected in soil samples out to soil boring SB-43. However, organic analyses of samples collected from the neutralization pits do not show the presence of VOCs other than isopropyl ether at concentrations greater than background and Well SW-2, located downgradient of the neutralization pits, did not show detectable levels of VOCs.

#### 7.6 Container Storage Area

VOCs and metals were detected in the soil around the perimeter of the container storage area in concentrations and at depths which varied from one boring to another indicating that their occurrence is related to surface spills. Moreover, the VOCs are generally limited in vertical extent to the uppermost 10 ft. of soil. *Specifically Upper Fill.*

Low levels of VOCs including methylene chloride, xylene, vinyl chloride and trans, 1,2-dichloroethylene were detected in groundwater at Well F. These VOCs characterize the container storage area and not the contaminants found in and around the cistern. In general, concentrations of metals (lead, chromium, barium and mercury) were found to vary in similar fashion to the VOCs and, even where the VOCs were highest, metals concentrations (except mercury) did not exceed twice background. Mercury was found at 1.5 mg/kg. Groundwater at Well F showed low levels of barium and chromium. *Source!*

#### 7.7 API Tank Basin Area

VOC concentrations in soil boring SB-50 were similar to background levels, and VOCs in SB-51 approached background at a depth of 16.5 ft. Metals in the soil sample from soil boring SB-51 which contained VOCs, showed concentrations less than metals background. Soil contamination with VOCs in the area of the API tank appears limited to the area around soil boring SB-51. *SB 51: 8'9.5' Till surface below fill. High VOC's (fluorides)*  
*SB 18 Contaminated also.*

### 7.8 Storm Water Collection System

Effluent limitations for COD, TOC and BOD have been exceeded at Outfall No. 001. During dry weather there is a low flow discharge from Outfall No. 001 which contains VOCs. These VOCs could cause elevated levels of COD, TOC and BOD. There are no known process piping connections to the storm water collection system.

Effluent limitation exceedances are apparently caused as subsurface perched water containing VOCs migrates to and infiltrates the storm water piping system. This infiltration also explains the low flow discharge which occurs during dry weather. During periods of wet weather, runoff flowing through the piping system decreases VOC concentrations as shown by the inverse proportional relationship of COD and flow rate.

The backfill around piping in areas around the cistern and solvent tank farm provides a conduit for migration of contaminants in perched water. Based on the COD data, there does not appear to be a VOC source to the storm water collection system in the plant areas west of the shipping dock.

*Where sampled!*

EA found no significant increase in the concentration of VOCs in downstream surface water, and any VOCs detected were close to the method detection limits.

Sampling conducted by OEPA also found VOCs in the outfall. Based on the OEPA's results, the discharge from the outfall can be assumed to cause the increase in downstream concentrations of VOCs. As EA's sampling supports no such conclusion, it is impossible to say with confidence that any downstream impacts are related to the HCC discharge, although the outfall is the probable source of elevated methylene chloride in downstream surface water as reported by the state.

At present, HCC collects the water infiltrating the storm water piping during dry weather periods. The water is collected in the 1500 gal. outfall tank and is transferred to the API tank, where it is stored for subsequent off-site disposal at a permitted facility. This operating practice minimizes the volume of perched water entering the creek through the outfall during dry weather periods.

How often pumped?  
where to?  
Contents?  
Managed as H.W.



## 8.0 ENVIRONMENTAL ASSESSMENT

Chemical residues attributable to past facility operations are found in soils, subsurface water and at an outfall to surface waters, however, there is no significant threat to the environment and any health related risks are limited to certain on-site locations and activities.

### 8.1 Contaminant Identification

Laboratory analysis has established the concentration of chemical residues in each media at the HCC site (Section 6.0).

*also  
pore  
H<sub>2</sub>O*

Residues found in soils differed from location to location at the site. Soils in and around the cistern, tank farm and container storage area contain elevated levels of the organic constituents, methylene chloride, acetone, 2-butanone, tetrachloroethylene, toluene, ethyl benzene and total xylenes. Soils in the "Chem-Pack" fill area contain high levels of iron, manganese, copper, chromium and zinc. The northwest fill area also contains elevated levels of iron, manganese, copper, nickel and lead. Areas in and around the neutralization pits show elevated levels of iron and isopropyl ether.

*Assumptions*

Groundwater containing elevated levels of methylene chloride was found downgradient of the tank farm, however, the vertical distribution of this and other organic chemicals in the groundwater is limited to the weathered shale. The areal extent of contaminated groundwater is limited and groundwater discharges to surface water which is of notably poor quality both upstream and downstream of the HCC site.

## 8.2 Exposure Evaluation

### Environmental Fate & Transport

A number of organic chemicals were found in the soil and groundwater at the HCC facility, however, for the purposes of this study it is not necessary to assess the migration and fate of each chemical. Methylene chloride is a useful, probable worst case indicator because it is the most common and mobile contaminant found at the site.

*Correct, but only represents sinkers.  
What about floaters?*

Concentrations of methylene chloride were greater than the other organics found in the groundwater, yet it was found to be generally equivalent to concentrations of organic contaminants found in the vadose soil environment. Organic compounds have a wide affinity for organic and inorganic solids in the soil, and the greater this affinity is for solids, the lower it is for water. Organic compounds with higher solubility in water migrate more readily than compounds which are less water soluble and the octanol/water partition coefficient roughly mimics the adsorptive properties it would have in soil. This is a ratio of the amount that a compound dissolves in octanol divided by the amount that dissolves in water. A high partition coefficient indicates that where a substance dissolves preferentially in octanol, it would be strongly adsorbed onto soil particles and would not be very mobile in the environment. ?

The octanol/water partition coefficients and water solubilities of some common organics found in the soil at HCC are as follows:

<u>Compound</u>	<u>Water Solubility (mg/l)</u>	<u>Octanol/Water Partition Coefficient (dimensionless)</u>
Methylene Chloride	17,000	18
Trichloroethylene	1,100	190
1,1,1-trichloroethane	950	150

The octanol/water partition coefficient for methylene chloride is low and it has a very high solubility in water and a very low affinity for soil. Methylene chloride is very mobile in the subsurface environment, and the fact that higher amounts of methylene chloride are present in the HCC groundwater than in the overlying soils indicates that the majority of it has migrated into the groundwater system.

← Only OEPA data

Methylene chloride was found to exist in higher concentrations in downstream surface water samples than upstream samples. It is reasonable to assume that contaminants in the groundwater (mainly methylene chloride) would migrate to and discharge into the surface water tributary system yet the upstream - downstream difference in methylene chloride is inconclusive.

#### Exposure Routes

Relevant exposure routes at the HCC site are limited to the consumption of contaminated groundwater or surface water, contact with contaminated soils and groundwater and contact with contaminated surface waters.

Vapors?

What about East!

There are no known domestic, industrial or municipal wells downgradient to the groundwater discharge point and the entire site, including the groundwater discharge which is owned and controlled by HCC. Potable groundwater in the area is obtained from underlying sandstone formations which are separated from the upper groundwater and surface water systems by a thick shale siltstone sequence.

← where!

In accord with USEPA's "Guidelines for Groundwater Classification under the EPA Groundwater Protection Strategy", the limited upper groundwater at the site would be classified as a Class III System, which applies to groundwaters that are not potential sources of drinking water.



The possibility of exposure through groundwater ingestion or dermal absorption is limited to on-site personnel that would have prior knowledge and would wear appropriate protective clothing. Personnel exposure to contaminated soil is limited to the "Chem-Pack" fill area, the neutralization pit area and inside the tank farm. Personnel working in these areas would have prior knowledge and would wear appropriate protective clothing. If excavation work is conducted in soils around the tank farm, "Chem-Pack" fill area, neutralization pits, northwest fill area, container storage area, cistern and API tank areas, contractor's personnel would have prior knowledge and would wear appropriate protective clothing.

Peoples exposure to contaminated soils, groundwater or surface waters is remote. The general public is not allowed on site without reason and supervision. All wells are capped and locked, the facility is surrounded by a fence which is also locked each night. The facility complies with Federal and state regulations governing security at treatment, storage and disposal sites.

### 8.3 Risk and Environmental Toxicity Evaluation

The consumption of groundwater migrating from the HCC vicinity is remote. There are no potable wells downgradient of the plume and all local potable water is supplied by municipal, industrial or private wells which obtain water from aquifers far below and separated from the limited groundwater available at HCC. All monitoring wells at the site are capped and locked. Contact with groundwater is not possible at the site unless permitted by HCC. Personnel engaged in sampling activities have prior knowledge and use of protective clothing. The possibility of future risk is reasonably avoided by placing a notice and restriction on groundwater use and contact in the property deed.

The risk to on-site personnel posed by contaminated soils found on-site is insignificant. HCC personnel regularly work with hazardous substances as part of their daily routine. HCC management requires



that all personnel wear protective clothing (i.e., boots, gloves, etc.) at all times while working on the site. The facility complies with Federal and state regulations governing personnel training for workers at treatment, storage and disposal sites.

Exposure to contaminated surface water is limited to casual contact by an unknowing population and is not likely because there are no nearby residential areas and the stream has no recreational value.

Ecological studies conducted by the OEPA have shown that there are no viable fish communities in the Deerlick Run drainage system which is classified as a "Nuisance Prevention Stream". A September 1986 report submitted by the OEPA, "Toxicity Evaluation Report on Surface Water Discharges, Hukill Chemical Corporation", recommends that this designation continue.

Downstream environmental and public health impacts caused by discharges from the HCC site are insignificant and cannot be measured with confidence. The entire Deerlick Run stream network downgradient of HCC is degraded by chemical discharges which cannot be attributed to HCC activities.

#### 8.4 Contaminants and Applicable Guidelines

The Deerlick Run drainage system is classified as a "Nuisance Prevention Stream" and neither the creek nor the groundwater is a potential drinking water source. Drinking water standards, Maximum Contaminant Levels (MCLs) and Recommended Maximum Contaminant Levels (RMCLs) are not relevant.

Table 67 shows the Water Quality Criteria for organic and inorganic contaminants identified in the creek, groundwater, soil and outfall at HCC. Of the organics detected in the creek by the OEPA and EA, all were detected at levels less than the acute aquatic toxicity criteria. With the exception of 1,1,1-trichlorethane and methylene

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TABLE 67

WATER QUALITY CRITERIA<sup>(1)</sup>

<u>Organics</u>	Acute Freshwater Aquatic Toxicity ug/l	Chronic Freshwater Aquatic Toxicity (ug/l)	Human Health <sup>(2)</sup> (ug/l)	OAC 3745-1-07 (ug/l)
✓ Methylene Chloride	11,000 (3)	(5)	0.19	9,700
Vinyl Chloride	(4)	(5)	5.25	-
Acetone	(4)	(5)	(6)	550,000
1,1 Dichloroethane	(4)	(5)	(6)	-
Trans-1,2 Dichloroethylene	11,600	(5)	(6)	7,000
2-Butanone	(4)	(5)	(6)	160,000
✓ 1,1,1-Trichloroethane	(4)	(5)	1.03	2,000
Trichloroethylene	45,000	(5)	80.7	1,700
Benzene	5,300	(5)	40.0	1,100
4-Methyl-2 Pentanone	(4)	(5)	(6)	-
2-Hexanone	(4)	(5)	(6)	-
Tetrachloroethylene	5,280	840	8.85	540
Toluene	17,500	(5)	424 mg/l	2,400
Ethyl Benzene	32,000	(5)	3.28 mg/l	1,400
Xylene	(4)	(5)	(6)	-
Isopropyl Ether	(4)	(5)	(6)	-
<u>Inorganics</u>				
Arsenic	440	(5)	17.5 ng/l	360
Barium	(4)	(5)	(6)	-
Cadmium	0.012-0.051, 1.5-6.3(7)			(H.O.) 46-186

Table 67 Continued . . .

Organics	Acute Freshwater Aquatic Toxicity ug/l	Chronic Freshwater Aquatic Toxicity (ug/l)	Human Health(2) (ug/l)	OAC 3745-1-07 (ug/l)
Chromium	2200-9900 (8)	44	(6)	(H.D) 2120-5800
Lead 74-400 (8)	74-400 (8)	(5)	(6)	Hardness dependent
Mercury	0.2, 4.1 (9)	(5)	146 ng/l	2.2
Copper	5.6, 12-43 (7)	(5)	(6)	(H.D) 23-67
Iron	(4)	(5)	(6)	-
Nickel	56-16, 1100-3100 (7)	(5)	100	(H.D) 1580-4770
Manganese	(4)	(5)	(6)	-
Zinc	47, 180-570	(5)	(6)	(H.D) 390-1060
Chloride	(4)	(5)	(6)	-
Fluoride	(4)	(5)	(6)	-
Phosphorus	(4)	(5)	(6)	-
Sulfate	(4)	(5)	(6)	-

NOTES:

1. The values in this table are the Water Quality Criteria Guidelines based on acute and chronic toxicity to freshwater aquatic and established water, the USEPA's "Clean Water Act".
2. This value is based on ingestion of aquatic organisms and excludes the consumption of a compound in drinking water. This value is based on a lifetime cancer risk of 10 EE-6.
3. This concentration applies to total halomethanes.
4. No acute toxicity level for freshwater aquatic life has been established.
5. No chronic toxicity level for freshwater aquatic life has been established.
6. No human health level for consumption of aquatic organisms has been established.
7. First values reported are the 24-hour average. Second range of values are the maximum values at any time and values are dependent on calcium carbonate hardness. The range corresponds to hardness ranging from 50 mg/l to 200 mg/l.
8. Acute toxicity level is dependent on calcium carbonate hardness. Values given correspond to hardness ranging from 50 mg/l to 200 mg/l.
9. The first value is the 24-hour average. The second is the maximum limit at any time.

*downstream*  
chloride detected at 20.5 ug/l and 349 ug/l by the OEPA, all organic concentrations were less than the Water Quality Criteria for human health, based on ingestion of contaminated aquatic organisms. Sampling and analysis by EA in October 1986 did not reveal the presence of either of these organics in the creek at HCC.

#### 8.5 Conclusions

Although facility operations at the HCC site have resulted in the release of contaminants, the potential for direct contact with or consumption of contaminated media is remote and there is no increased risk to an unknowing population or to the environment.

## 9.0 PROJECT OBJECTIVES AND ALTERNATIVE CORRECTIVE ACTIONS

The need for remedial action at the HCC facility is limited to those measures which would minimize the existing low order threat to on-site personnel and to an unknowing population which may contact downstream surface water. Specific project objectives are established in this section based on the results of the site work and the Environmental Assessment. Alternative corrective actions will be presented and discussed in Task 4, "Review of Alternative Corrective Actions" as described in EA's November 1985 engineering report, "Plan for Determining the Extent of Potential Contamination".

### 9.1 Project Objectives

The specific objectives to be achieved at the HCC site are as follows:

1. Minimize the possibility that personnel could be exposed to soils in the areas of the solvent tank farm, underground cistern, Chem-Pack fill, northwest fill, neutralization pits, no free liquid storage area and API tank basin.
2. Prevent consumption and minimize physical exposure to groundwater and perched water at the site.
3. Prevent consumption of surface waters transiting the site.
4. Minimize the generation of perched water in the tank farm.
5. Minimize the migration of contamination from the surface to the perched water and groundwater.
6. Minimize the potential for further releases of waste constituents.

Physical exposures to contaminated soils, perched water and groundwater and the consumption of groundwater are effectively controlled at HCC. The project objective of preventing on-site contact with or consumption of affected media is achieved by current operating practices.

Although HCC cannot control public access at off-site locations, the surface waters are classified by OEPA as "Nuisance Prevention Stream", which has no recreational value and is not a drinking water source.

## 9.2 Alternative Corrective Actions

The project objectives can be achieved through a limited remedial action program with the following outputs:

1. Manage groundwater at the site in accord with RCRA alternate concentration limits through groundwater monitoring and institutional control. *264.94(b)*  
*(Objective 5, 6, 6)*
2. Minimize the migration of residuals from the surface to perched water and from perched water to groundwater. *(Objective 5)*
3. Minimize the discharge of residuals to surface water at Outfall 001. *(Objective 6)*
4. Ensure that adequate notice survives the use of the site by HCC. *(Objectives 1+2)*

*What about surface water and  
GW discharge affects.*